

Namangan muhandislik-qurilish instituti  
Oliy matematika kafedrası

KI ta'lim yo`nalishiga

## **Oliy matematika**

fanidan III semestrdađi o`zlashtirish  
darajasini aniqlash uchun beriladigan  
hisob grafik ishi va topshiriqlar to`plami

Namangan - 2020

Oliy matematika kafedrası yig`ilishida ko`rib chiqilib, chop etishga ruxsat etilgan  
Yig`ilish bayoni № 2020 y

Namangan muhandislik-qurilish instituti ilmiy-metodik kengashida ko`rib  
chiqilib, chop etishga tavsiya etilgan  
Majlis bayoni № 2020 y

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## TALABALAR BILIMINI NAZORAT QILISH VA BAHOLASH

Talabalar bilimini nazorat qilish va baholash tartibi O'zbekiston Respublikasi Prezidentining 2018 yil 5 iyundagi PQ-3775 son "Oliy ta'lim muassasalarida ta'lim sifatini oshirish va ularning mamlakatda amalga oshirilayotgan keng qamrovli islohatlarda faol ishtirokini ta'minlash bo'yicha qo'shimcha chora-tadbirlar to'g'risida"gi qaroriga muvofiq O'zbekiston Respublikasi Oliy va o'rta maxsus ta'lim vazirligining 2018 yil 9 avgustdagi 19-2018 son buyrug'i bilan tasdiqlangan va O'zbekiston Respublikasi Adliya vazirligida 2018 yil 26 sentyabrda 3069 son bilan davlat ro'yxatidan o'tkazilgan "Oliy ta'lim muassasalarida talabalar bilimini nazorat qilish va baholash tizimi to'g'risidagi nizom" asosida ishlab chiqildi.

### Nazorat turlari va baholash mezonlari

#### 1-§. Nazorat turlari

1. Namangan Muhandislik Qurilish Instituti Oliy matematika kafedrasida talabalar bilimini nazorat qilish oraliq va yakuniy nazorat turlarini o'tkazish orqali amalga oshiriladi.

2. Oraliq nazorat semestr davomida ishchi fan dasturining tegishli bo'limi tugagandan keyin talabaning bilim va amaliy ko'nikmalarini baholash maqsadida o'quv mashg'ulotlari davomida o'tkaziladi.

3. Matematika (Oliy matematika) fanidan oraliq nazorat fanning xususiyatidan kelib chiqqan holda har bir semestrda ikki marta o'tkaziladi. Oraliq nazorat turini ma'ruza va amaliy mashg'ulot o'qituvchilari birgalikda o'tkazadi.

4. Oraliq nazorat turini o'tkazish muddati fanning xususiyati va fanga ajratilgan soatlardan kelib chiqib kafedra tomonidan belgilanadi va kalendar rejada ko'rsatiladi.

Matematika (Oliy matematika) fanidan oraliq nazorat yozma ish shaklida o'tkaziladi.

5. Har bir oraliq nazorat topshiriqlari o'tilgan mavzularga taalluqli beshta misol va masalalardan iborat bo'lib, kafedra professor-o'qituvchilari tomonidan ishlab chiqiladi va kafedra mudiri tomonidan tasdiqlanadi.

6. Talabaning amaliy, seminar mashg'ulotlari, hisob grafik ishlari va mustaqil ta'lim topshiriqlarini bajarishi, shuningdek uning ushbu mashg'ulotlardagi faolligi fan o'qituvchisi tomonidan baholab boriladi.

Talabani oraliq nazorat turi bo'yicha baholashda, hisob grafik ishlarini bajarishi va uning o'quv mashg'ulotlari davomida olgan baholari inobatga olinadi.

7. Yakuniy nazorat turi semestr yakunida talabaning nazariy bilim va amaliy ko'nikmalarini o'zlashtirish darajasini aniqlash maqsadida o'tkaziladi.

8. Yakuniy nazorat "Yozma ish" shaklida o'tkaziladi. Yakuniy nazorat semestr yakunida bir marta o'tkaziladi.

Matematika (Oliy matematika) fanidan yakuniy nazorat topshiriqlariga semestr davomida o'tilgan mavzularga taalluqli ikkita nazariy savol va uchta misol va masalalar kiritiladi.

9. Yakuniy nazorat turi NamMQIning tegishli fakultet dekani yoki o'quv-uslubiy bo'limi tomonidan ishlab chiqiladigan hamda o'quv ishlari bo'yicha prorektor tomonidan tasdiqlanadigan yakuniy nazorat turlarini o'tkazish jadvaliga muvofiq o'tkaziladi.

#### 2-§. Talabalar bilimini baholash mezonlari

10. Talabalarning bilimi quyidagi mezonlar asosida:

-talaba mustaqil xulosa va qaror qabul qiladi, ijodiy fikrlay oladi, mustaqil mushohada yuritadi, olgan bilimni amalda qo'llay oladi, fanning (mavzuning) mohiyatini tushunadi, biladi, ifodalay oladi, aytib beradi hamda fan (mavzu) bo'yicha tasavvurga ega deb topilganda - 5 (a'lo) baho;

-talaba mustaqil mushohada yuritadi, olgan bilimni amalda qo'llay oladi, fanning (mavzuning) mohiyatini tushunadi, biladi, ifodalay oladi, aytib beradi hamda fan (mavzu) bo'yicha tasavvurga ega deb topilganda- 4 (yaxshi) baho;

-talaba olgan bilimni amalda qo'llay oladi, fanning (mavzuning) mohiyatni tushunadi, biladi, ifodalay oladi, aytib beradi hamda fan (mavzu) bo'yicha tasavvurga ega deb topilganda - 3 (qoniqarli) baho;

-talaba fan dasturini o'zlashtirmagan fanning (mavzuning) mohiyatini tushunmaydi hamda fan (mavzu) bo'yicha tasavvurga ega emas deb topilganda 2 (qoniqarsiz) baho bilan baholanadi.

### **Talabalar bilimni baholash**

11. Talabalar bilimni baholash 5 baholik tizimda amalga oshiriladi.

12. Oraliq nazorat turini o'tkazish va mazkur nazorat turi bo'yicha talabaning bilimni baholash o'quv mashg'ulotlarini olib borgan professor-o'qituvchi tomonidan amalga oshiriladi.

Oraliq nazorat turini baholash quyidagicha amalga oshiriladi.

Matematika (Oliy matematika) fanidan oraliq nazorat natijasi 100 ballik shkalada aniqlanib, "Oliy ta'lim muassasalarida talabalar bilimni nazorat qilish va baholash tizimi to'g'risidagi nizomga Ilova" ning 1-jadvaliga ko'ra 5 baholik tizimida baholanadi. 100 baldan kamida 60 ball to'plagan talaba oraliq nazoratdan o'tgan hisoblanadi. Oraliq nazorat natijasini 100 ballik shkalada quyidagicha aniqlanadi: yozma ish natijasi 50 balgacha baholanadi; talabaning amaliy seminar va mustaqil ta'lim topshiriqlarini (hisob grafik ishi) bajarishi, shuningdek uning ushbu mashg'ulotlardagi faolligi 50 balgacha baholanadi (hisob grafik ishi 10 balgacha, darslarga qatnashishi 10 balgacha, darslarda faolligi 30 balgacha).

Yakuniy nazorat turini o'tkazish va mazkur nazorat turi bo'yicha talabaning bilimni baholash o'quv mashg'ulotlarini olib bormagan professor-o'qituvchi tomonidan amalga oshiriladi. Yakuniy nazorat turini baholash quyidagicha amalga oshiriladi.

Berilgan beshta topshiriqning har biri maksimal 20 ball doirasida baholanadi. Talaba to'plagan ballari 60 dan kam bo'lsa, "2" baho, 60 dan 70 ballgacha bo'lsa, "3" baho, 70 dan 90 gacha bo'lsa, "4" baho va 90 va undan yuqori bo'lsa, "5" baho bilan baholanadi.

O'quv mashg'ulotlarini olib borgan professor-o'qituvchi yakuniy nazorat turini o'tkazishda ishtirok etishi taqiqlanadi.

Yakuniy nazorat turini o'tkazishda kelishuv asosida boshqa oliy ta'lim muassasalarining tegishli fan bo'yicha professor-o'qituvchilari jalb qilinishi mumkin.

13. Nazorat turlarini o'tkazilishi NamMQI ta'lim sifatini nazorat qilish bo'limi tomonidan doimiy ravishda o'rganib boriladi. Bunda nazorat turlarini o'tkazilish tartibi buzilganligi aniqlangan hollarda, o'tkazilgan nazorat turlarining natijalari bekor qilinishi hamda tegishli nazorat turi qaytadan o'tkazilishi mumkin.

14. Talaba yakuniy nazorat turi o'tkaziladigan muddatga qadar oraliq nazorat turini topshirgan bo'lishlari shart.

15. Oraliq nazorat turini topshirmagan, shuningdek ushbu nazorat turi bo'yicha "2" (qoniqarsiz) baho bilan baholangan talaba yakuniy nazorat turiga kiritilmaydi.

Yakuniy nazorat turiga kirmagan yoki kiritilmagan, shuningdek ushbu nazorat turi bo'yicha "2" (qoniqarsiz) baho bilan baholangan talaba akademik qarzdor hisoblanadi.

16. Talaba uzrli sabablarga ko'ra oraliq va (yoki) yakuniy nazorat turiga kirmagan taqdirda ushbu talabaga tegishli nazorat turini qayta topshirishga fakultet dekanining farmoyishi asosida ruxsat beriladi.

17. Talabalar kuzgi semestr natijalari bo'yicha 3 tagacha fandan (fanlardan) akademik qarzdorligi bo'lgan hollarda talabaga bir oygacha, bahorgi semestr natijalari bo'yicha 3 tagacha fandan (fanlardan) akademik qarzdorligi bo'lgan talabaga oraliq va (yoki) yakuniy nazorat turlarini yangi o'quv yili boshidan qayta topshirish uchun 1 oy muddat beriladi.

Fanlardan akademik qarzdorligi 4 ta va undan ko'p bo'lgan talabalarga qayta topshirishga ruxsat berilmaydi va ular oliy ta'lim muassasasi rektorining buyrug'i bilan kursdan qoldiriladi.

18. Talabaga oraliq yoki yakuniy nazorat turini qayta topshirish uchun berilgan muddat davomida talaba tomonidan qayta topshirishlar soni 2 martadan ko'p bo'lmasligi kerak.

Talaba oraliq yoki yakuniy nazorat turini birinchi marta qayta topshirishdan o'ta olmagan taqdirda, fakultet dekani tomonidan komissiya tuziladi. Komissiya tarkibi kafedra professor-o'qituvchilari va soha mutaxassislari orasidan shakllantiriladi.

Ikkinchi marta oraliq yoki yakuniy nazorat turini o'tkazish va talabani baholash mazkur komissiya tomonidan amalga oshiriladi.

19. Berilgan muddat davomida mavjud bo'lgan qarzdorlikni topshira olmagan talaba bo'yicha fakultet dekani bildirgi bilan oliy ta'lim muassasasi rektorini habardor qiladi va ushbu talaba rektor buyrug'i asosida kursdan qoldiriladi.

20. Kursda qoldirilgan talaba fanni (fanlarni) o'zlashtirmagan semestr boshidan to'lov-kontrakt asosida mazkur o'quv yilining tegishli semestri uchun tasdiqlangan o'quv rejaga muvofiq o'qishni davom ettiradi.

21. Baholash natijasidan norozi bo'lgan talabalar fakultet dekani tomonidan tashkil etiladigan Apellyatsiya komissiyasiga apellyatsiya berish huquqiga ega.

22. Apellyatsiya komissiyasi tarkibiga talabani baholashda ishtirok etmagan kafedraning professor-o'qituvchilari orasidan komissiya raisi va kamida to'rt nafar a'zo kiritiladi.

23. Talaba baholash natijasidan norozi bo'lgan taqdirda, baholash natijasi e'lon qilingan vaqtdan boshlab 24 soat davomida apellyatsiya berishi mumkin. Talaba tomonidan berilgan apellyatsiya Apellyatsiya komissiyasi tomonidan 2 kun ichida ko'rib chiqilishi lozim.

24. Talabaning apellyatsiyasini ko'rib chiqishda talaba ishtirok etish huquqiga ega.

25. Apellyatsiya komissiyasi talabaning apellyatsiyasini ko'rib chiqib, uning natijasi bo'yicha tegishli qaror qabul qiladi. Qarorda talabaning tegishli fanni o'zlashtirgani yoki o'zlashtira olmaganini ko'rsatiladi.

Apellyatsiya komissiyasi tegishli qarorni fakultet dekani va talabaga yetkazilishini ta'minlaydi.

## 1-ORALIQ NAZORAT UCHUN TOPSHIRIQLAR

### I. Quyidagi funksiyalarning aniqlanish sohasini toping (1-30).

1.  $z = \frac{1}{x-y}$
2.  $z = \sqrt{x+y}$
3.  $z = \frac{1}{x+y}$
4.  $z = \sqrt{x^2 + y^2 - 9}$
5.  $z = \sqrt{x-y}$
6.  $z = \ln\left(\frac{x^2}{9} + \frac{y^2}{4} - 1\right)$
7.  $z = \frac{1}{2-x^2-y^2}$
8.  $z = \arcsin \frac{y-1}{x}$
9.  $z = \frac{1}{2x-2y}$
10.  $z = \sqrt{25-x^2-y^2}$
11.  $z = \frac{\sqrt{4x-y^2}}{\ln(1-x^2-y^2)}$
12.  $z = \sqrt{2x-2y}$
13.  $z = \sqrt{x+y+1}$
14.  $z = \frac{1}{x+y} + 1$
15.  $z = \sqrt{x^2 + y^2 - 16}$
16.  $z = \ln\left(\frac{x^2}{9} + \frac{y^2}{4} - 2\right)$
17.  $z = \frac{1}{4-x^2-y^2}$
18.  $z = \arcsin \frac{y+1}{x}$
19.  $z = \sqrt{16-x^2-y^2}$
20.  $z = \sqrt{x-3y}$
21.  $z = \frac{1}{x-y} + 3$
22.  $z = \frac{1}{\ln(1-x^2-y^2)}$
23.  $z = \frac{1}{x+y} - 2$
24.  $z = \sqrt{2x-y+1}$
25.  $z = \arcsin \frac{y+2}{x}$
26.  $z = \sqrt{x^2 + y^2 - 25}$
27.  $z = \ln\left(\frac{x^2}{9} + \frac{y^2}{4} - 4\right)$
28.  $z = \frac{1}{9-x^2-y^2}$
29.  $z = \sqrt{36-x^2-y^2}$
30.  $z = \frac{3}{\ln(1-x^2-y^2)}$

### II. Quyidagi funksiyalarning barcha ikkinchi tartibli xususiy hosilalarini toping (1-30).

1.  $z = \frac{y}{x^2 + y^2}$
2.  $z = \frac{xy}{x+y}$
3.  $z = \sqrt{2x^2 + 3y^2}$
4.  $z = \frac{x+y}{xy}$
5.  $z = \frac{x+y}{x^2 y^2}$
6.  $z = \sqrt{3x+2y}$
7.  $z = x^2 + x^2 y + 2y^2$
8.  $z = x^2 + xy^2 + 3y^2$
9.  $z = xy^3 + 2x^4$
10.  $z = 2xy^2 + y^4$
11.  $z = 2x^2 y + 3x^5 y$
12.  $z = 5x^2 y^3 + x^3 y^2$
13.  $z = \sqrt{xy - x^2}$
14.  $z = \sqrt[3]{x^2 y}$
15.  $z = \frac{3x}{x^2 + y^2}$
16.  $z = \frac{4}{x^2 + y^2}$
17.  $z = \frac{x-y}{x+y}$
18.  $z = \sqrt{x^2 + 4y^2}$
19.  $z = \frac{x+y}{x-y}$
20.  $z = \frac{2x-y}{x^2 + y^2}$
21.  $z = 3xy^2 + 2yx^2$
22.  $z = 4x^2 + 3xy + 2y^2$

$$23. z = 5x^2 + 4xy + 3y^2$$

$$24. z = x^2 y^3 + x^4$$

$$25. z = x^3 y^2 + y^4$$

$$26. z = 2xy + 3x^5 y$$

$$27. z = 5x^2 y + x^3 y^2$$

$$28. z = \sqrt{xy}$$

$$29. z = \sqrt[3]{xy}$$

$$30. z = \frac{x}{x^2 + y^2}$$

### III. Ikki karrali integrallarni hisoblang.

$$1. \int_0^{2\pi} \cos^2 dx \int_0^a y dy$$

$$2. \int_0^{\pi} \cos dx \int_0^{\pi} y dy$$

$$3. \int_0^1 x dx \int_0^x y dy$$

$$4. \int_1^2 x dx \int_{-x}^{\sqrt{x}} y dy$$

$$5. \int_1^2 dx \int_{\sqrt{x}}^x dy$$

$$13. \int_0^1 x dx \int_{2x-1}^{x^2} (x-y) dy$$

$$14. \int_0^1 dx \int_{x-1}^{x+1} y dy$$

$$15. \int_0^1 x dx \int_{2x-1}^{2x+1} dy$$

$$16. \int_{-2}^0 x^2 dx \int_{3x+1}^{3x} dy$$

$$17. \int_0^2 x^2 dx \int_{x-1}^{x+1} (x-y) dy$$

$$18. \int_0^1 x^2 dx \int_{x-1}^{x+1} x^2 y dy$$

$$6. \int_2^4 \sqrt{x} dx \int_0^{x^2} dy$$

$$7. \int_{-1}^1 dx \int_0^x (x-y) dy$$

$$8. \int_0^2 dx \int_0^{2x} (x^2 - y^2) dy$$

$$9. \int_0^3 dx \int_0^{2x} (x-y) dy$$

$$10. \int_{-1}^1 dx \int_{-x}^x (x^2 - y) dy$$

$$19. \int_0^{\frac{\pi}{2}} \cos x dx \int_0^{\pi} \sin y dy$$

$$20. \int_0^{\frac{\pi}{2}} \cos^2 x dx \int_0^{\pi} dy$$

$$21. \int_0^{2\pi} \sin x dx \int_0^{\pi} \sin y dy$$

$$22. \int_0^{\frac{\pi}{2}} \sin^2 x dx \int_0^{\pi} dy$$

$$23. \int_e^{e^2} x dx \int_0^{\frac{1}{x}} y dy$$

$$24. \int_1^3 dx \int_{x^2}^x (x-y) dy$$

$$11. \int_0^2 x dx \int_{\sqrt{x}}^{x^2} dy$$

$$12. \int_0^4 dx \int_{\sqrt{x}}^{x^2} (x-y) dy$$

$$25. \int_{-2}^0 dx \int_{x^2}^x dy$$

$$26. \int_0^3 x dx \int_0^x (x^2 - y^2) dy$$

$$27. \int_{-1}^1 x dx \int_{2x-1}^{2x+1} dy$$

$$28. \int_0^1 x dx \int_{-2x}^{2x} (x^2 - y^2) dy$$

$$29. \int_0^4 dx \int_{x^2}^{\sqrt{x}} dy$$

$$30. \int_2^4 \sqrt{x} dx \int_0^{x^2} y dy$$

### IV. a) Ikki karrali integral yordamida:

1.  $y^2 = x, y = x + 2, y = -2, y = 2$  chiziqlar bilan chegaralangan figurani yuzini hisoblang.
2.  $y = (x-1)^2, y^2 + x^2 = 1$  chiziqlar bilan chegaralangan figurani yuzini hisoblang.
3.  $y^2 + x^2 = 1, x + y = 1$  chiziqlar bilan chegaralangan figurani yuzini hisoblang.
4.  $y = 4 - x^2, x + y = 1$  chiziqlar bilan chegaralangan figurani yuzini hisoblang.
5.  $y = x^2, x + y = 2$  chiziqlar bilan chegaralangan figurani yuzini hisoblang.
6.  $y = (x+1)^2, y^2 + x^2 = 1$  chiziqlar bilan chegaralangan figurani yuzini hisoblang.
7.  $y^2 = x, y = x^2$  chiziqlar bilan chegaralangan figurani yuzini hisoblang.
8.  $y = x + 2, y = -2, y = 2$  chiziqlar bilan chegaralangan figurani yuzini hisoblang.
9.  $y^2 + x^2 = 1, y = x^2$  chiziqlar bilan chegaralangan figurani yuzini hisoblang.
10.  $y = -x^2, x - y = 2$  chiziqlar bilan chegaralangan figurani yuzini hisoblang.
11.  $\iint_D x^2 y dx dy$ ,  $D$  soha  $y = -x^2$  va  $x = y^2$  chiziqlar bilan chegaralangan.
12.  $\iint_D e^{-y} dx dy$ ,  $D$  soha uchlari (0;0), (0;1) va (1;1) nuqtalarda bo`lgan uchburchak.
13.  $\iint_D xy^2 dx dy$ ,  $D$  soha  $y^2 = x, x = 1$  chiziqlar bilan chegaralangan.
14.  $\iint_D xy dx dy$ ,  $D$  soha uchlari (2;4); (5;4); (5;2); (2;-2) bo`lgan to`rtburchak.
15.  $\iint_D x^2 y dx dy$ ,  $D$  soha uchlari (-2;2), (-1;2), (6;2) bo`lgan uchburchak.

**b) Quyidagi egri chiziqli integrallarni hisoblang (16-30).**

16.  $\int_L x^2 y dx + y^2 x dy$ , bu yerda  $L$  uchlari A(1;1) B(2;3) nuqtalarda bo`lgan kesma.
17.  $\int_L x^2 y dx + y^2 x dy$ , bu yerda  $L$   $x = t, y = t^3$  yoyning  $0 \leq t \leq 1$  oraliqdagi bo`lagi.
18.  $\int_L dx + y dy$ , bu yerda  $L$   $y = x^3$  parabolaning uchlari O (0;0) A(1;1) nuqtalarda bo`lgan yoyi.
19.  $\int_L xy dx + y dy$ , bu yerda  $L$   $x = t - \sin t, y = 1 - \cos t$  yoyning  $0 \leq t \leq \pi$  oraliqdagi bo`lagi.
20.  $\int_L (x^2 - y^2) dx$ , bu yerda  $L$   $y = x^2$  parabolaning A(1;1) B(2;4) nuqtalarda bo`lgan yoyi.
21.  $\int_L -x \cos y dx + y \sin x dy$ , bu yerda  $L$  uchlari A (0;0) B ( $\pi$ ;  $2\pi$ ) nuqtalarda bo`lgan kesma.
22.  $\int_L xy dx + (y - x) dy$ , bu yerda  $L$   $y = x$  chiziqning A(0;0) B(2;2) nuqtalarda bo`lgan kesma.
23.  $\int_L xy dx + (y - x) dy$ , bu yerda  $L$   $y^2 = x$  parabolaning A(0;0) B(4;2) nuqtalarda bo`lgan yoyi.
24.  $\int_L x^2 y dx + yx^2 dy$ , bu yerda  $L$   $y = x^2$  parabolaning A(0;0) B(2;4) nuqtalarda bo`lgan yoyi.



25.  $\int_L x^2 dx + y^2 dy$ , bu yerda  $L$   $y = x^3$  parabolaning  $A(0;0)$  nuqtadan  $B(2;8)$  nuqttagacha bo'lgan yoyi.

26.  $\int_L y dx - x dy$ , bu yerda  $L$   $y = x^2 - 1$  egri chiziqning  $A(0;-1)$  nuqtadan  $B(1;0)$  nuqttagacha bo'lgan yoyi.

27.  $\int_L y(x-y) dx + x dy$ , bu yerda  $L$   $y = 2x$  chiziqning  $A(0;0)$  nuqtadan  $B(1;2)$  nuqttagacha bo'lgan yoyi.

28.  $\int_L y(x-y) dx + x dy$ , bu yerda  $L$   $y = 2x^2$  chiziqning  $A(0;0)$  nuqtadan  $B(1;2)$  nuqttagacha bo'lgan yoyi.

29.  $\int_L y(x-y) dx + x dy$ , bu yerda  $L$   $y^2 = 4x$  chiziqning  $A(0;0)$  nuqtadan  $B(1;2)$  nuqttagacha bo'lgan yoyi.

30.  $\int_L (xy-1) dx + x^2 y dy$ , bu yerda  $L$   $y = -2x + 2$  chiziqning  $A(1;0)$  nuqtadan  $B(0;2)$  nuqttagacha bo'lgan yoyi.

### V. Quyidagi qatorlarning yig'indisini toping (1-30).

$$1. \sum_{n=1}^{\infty} \frac{1}{n^2 + 15n + 56};$$

$$2. \sum_{n=1}^{\infty} \frac{1}{n^2 + 11n + 30};$$

$$3. \sum_{n=1}^{\infty} \frac{1}{n^2 + 9n + 20};$$

$$4. \sum_{n=1}^{\infty} \frac{1}{n^2 + 13n + 42};$$

$$5. \sum_{n=1}^{\infty} \frac{1}{9n^2 - 3n - 2};$$

$$6. \sum_{n=1}^{\infty} \frac{1}{4n^2 - 1};$$

$$7. \sum_{n=1}^{\infty} \frac{1}{n^2 + 3n + 2};$$

$$8. \sum_{n=1}^{\infty} \frac{1}{n^2 + 5n + 6};$$

$$9. \sum_{n=1}^{\infty} \frac{1}{49n^2 + 7n - 12};$$

$$10. \sum_{n=1}^{\infty} \frac{1}{n^2 + 9n + 20};$$

$$11. \sum_{n=1}^{\infty} \frac{1}{n^2 + 17n + 72};$$

$$12. \sum_{n=1}^{\infty} \frac{1}{n^2 + 19n + 90};$$

$$13. \sum_{n=1}^{\infty} \frac{1}{n^2 + 21n + 110};$$

$$14. \sum_{n=1}^{\infty} \frac{1}{n^2 + 23n + 120};$$

$$15. \sum_{n=1}^{\infty} \frac{1}{n^2 + 33n + 252};$$

$$16. \sum_{n=1}^{\infty} \frac{1}{n^2 + 25n + 156};$$

$$17. \sum_{n=1}^{\infty} \frac{1}{n^2 + 27n + 182};$$

$$18. \sum_{n=1}^{\infty} \frac{1}{n^2 + 29n + 210};$$

$$19. \sum_{n=1}^{\infty} \frac{1}{n^2 + 3n + 2};$$

$$20. \sum_{n=1}^{\infty} \frac{1}{n^2 + 31n + 240}$$

$$21. \frac{1}{1 \cdot 3} + \frac{1}{3 \cdot 5} + \frac{1}{5 \cdot 7} + \frac{1}{7 \cdot 9} + \dots$$

$$22. \frac{1}{1 \cdot 2 \cdot 3} + \frac{1}{2 \cdot 3 \cdot 4} + \frac{1}{3 \cdot 4 \cdot 5} + \dots$$

$$23. \frac{2}{3} + \frac{1}{3} + \frac{1}{6} + \frac{1}{12} + \frac{1}{24} + \dots$$

$$24. \frac{1}{1 \cdot 2} + \frac{1}{2 \cdot 3} + \frac{1}{3 \cdot 4} + \frac{1}{4 \cdot 5} + \dots$$

$$25. 1 + \frac{1}{3} + \frac{1}{6} + \frac{1}{10} + \frac{1}{15} + \dots$$

$$26. \frac{1}{1 \cdot 3 \cdot 5} + \frac{1}{3 \cdot 5 \cdot 7} + \frac{1}{5 \cdot 7 \cdot 9} + \frac{1}{7 \cdot 9 \cdot 11} + \dots$$

$$27. \frac{3}{1 \cdot 4} + \frac{5}{4 \cdot 9} + \frac{7}{9 \cdot 36} + \dots$$

$$28. \frac{1}{3} + \frac{1}{8} + \frac{1}{15} + \frac{1}{24} + \dots$$

$$29. \sum_{n=1}^{\infty} \frac{1}{n^2 + 7n + 12};$$

$$30. \sum_{n=1}^{\infty} \frac{1}{4n^2 + 16n + 15};$$

## 2-ORALIQ NAZORAT UCHUN TOPSHIRIQLAR

### I. Darajali qatorning yaqinlashish intervalini toping (1-30).

$$1. \sum_{n=1}^{\infty} \frac{x^n}{3^n n!}$$

$$2. \sum_{n=1}^{\infty} \frac{(n+1)^2 x^n}{2^n}$$

$$3. \sum_{n=1}^{\infty} \left( \frac{n}{n+1} \right)^n x^n$$

$$4. \sum_{n=1}^{\infty} \frac{x^{2n-1}}{3n}$$

$$5. \sum_{n=1}^{\infty} \frac{(2n)! x^n}{n^n}$$

$$6. \sum_{n=1}^{\infty} \frac{n! x^n}{(n+1)^n}$$

$$7. \sum_{n=1}^{\infty} \frac{n^{\frac{n}{2}}}{(n+1)!} x^n$$

$$8. \sum_{n=1}^{\infty} \frac{x^n}{n(n+1)}$$

$$9. \sum_{n=1}^{\infty} \frac{2^n x^n}{\sqrt{(2n-1)3^n}}$$

$$10. \sum_{n=1}^{\infty} \frac{n^{\frac{n}{3}}}{n!} x^n$$

$$11. \sum_{n=1}^{\infty} \frac{x^n}{n}$$

$$12. \sum_{n=1}^{\infty} n x^n$$

$$13. \sum_{n=1}^{\infty} \frac{x^n}{n^2}$$

$$14. \sum_{n=1}^{\infty} \frac{x^n}{(2n)!}$$

$$15. \sum_{n=1}^{\infty} \frac{n x^n}{(n+1)3^n}$$

$$16. \sum_{n=1}^{\infty} \frac{x^n}{2^n \sqrt{n}}$$

$$17. \sum_{n=1}^{\infty} \frac{x^n}{(n+1)7^{n-1}}$$

$$18. \sum_{n=1}^{\infty} \frac{x^n}{n!}$$

$$19. \sum_{n=1}^{\infty} 5^n x^n$$

$$20. \sum_{n=1}^{\infty} \frac{4x^n}{2^n}$$

$$21. \sum_{n=1}^{\infty} \frac{3^n x^n}{n!}$$

$$22. \sum_{n=1}^{\infty} \frac{2^n}{n(n+1)} x^n$$

$$23. \sum_{n=1}^{\infty} \frac{(n!)^2}{(2n)!} x^n$$

$$24. \sum_{n=1}^{\infty} \left( 1 + \frac{1}{n} \right)^2 x^n$$

$$25. \sum_{n=1}^{\infty} \frac{x^{3n}}{8^n}$$

$$26. \sum_{n=1}^{\infty} \frac{3^n n!}{(n+1)^n} x^n$$

$$27. \sum_{n=1}^{\infty} \frac{n^2}{n+1} x^n$$

$$28. \sum_{n=1}^{\infty} \frac{x^n}{n^3}$$

$$29. \sum_{n=1}^{\infty} \frac{n^5 x^n}{(n+1)^n}$$

$$30. \sum_{n=1}^{\infty} \frac{3^n x^n}{\sqrt[3]{n}}$$

## II. Kombinatorika elementlariga doir masalalar

1. Guruhdagi 15 ta talabadan 9 tasi o'g'il bola. Tennis musobaqasida qatnashish uchun 2 ta o'g'il bola va 1 ta qizdan iborat komandani necha usul bilan tuzish mumkin ?
2. Guruhdagi 12 ta talabadan davra suhbatida aylanma stol atrofida necha xil usul bilan joylashtirish mumkin ?
3. Guruhdagi 20 ta talabadan faqat 3 tasiga mukofot topshirish kerak. SHu uchta talabani necha usul bilan tanlash mumkin ?
4. SHaxmat musobaqasida 21 ta talaba qatnashayapti. Talabalar o'zaro bir martadan uchrashishsa, jami nechta partiya o'ynaladi?.
5. Futbol komandasida 3 ta darvozabon va 17 ta o'yinchi bor. SHu komandani o'tkaziladigan o'yinga necha xil usulda maydonga tushirish mumkin?(maydonga 1 ta darvozabon va 10 o'yinchi tushiriladi).
6. Aylanadagi ixtiyoriy 11 ta nuqtadan jami nechta vatar o'tkazish mumkin?
7. Aylanadagi ixtiyoriy 13 ta nuqtadan, uchlari shu nuqtalarda bo'lgan nechta uchburchak yasash mumkin?
8. Oliy liga musobaqalarida 16 ta komanda ishtirok etadi. Oltin, kumush va bronza medallarini necha xil usul bilan o'zaro bo'lishib olinishi mumkin?
9. Gruppada 30 ta o'quvchi bor. Ularning ichidan 3 kishini kompyuterda ishlash uchun ajratish kerak. Buni necha usul bilan bajarish mumkin?
10. Ta'tildan qaytgan guruh talabalari o'zaro salomlashishdi. Guruhda 20 ta talaba bo'lsa, salomlashishlar sonini toping.
11. Korxonada 10 ta erkak va 8 ta ayol xodim ishlaydi. Shu korxonadan bitta xodimni necha xil usulda tanlab olish mumkin?
12. 10 ta talabadan iborat guruhga ikkita yo'llanma ajratildi. Bu yo'llanmalarni necha xil usul bilan tarqatish mumkin?
13. Qurilishda 10 ta suvoqchi va 8 ta bo'yoqchi ishlaydi. Ulardan bir suvoqchi va bir bo'yoqchidan iborat juftlikni necha usulda tanlash mumkin?
14. Nazoratchi korxonada ishlab chiqarilgan 5 ta maxsulot sifatini ketma-ket tekshirishi kerak. Nazoratchi buni nechta usulda amalga oshirishi mumkin?
15. Ishlab chiqarish korxonasini tekshirish uchun besh kishidan iborat guruh ajratildi. Shu besh kishidan tarkibida uch kishi bo'lgan guruhni necha xil usulda tuzish mumkin?
16. Tikuvchilik fabrikasida ishlayotgan xodimga haftaning ixtiyoriy ikki kunini dam olish uchun tanlash imkonini berildi. Xodim dam olish kunlarini necha usulda tanlashi mumkin?
17. Italiya A-seriyasida jami 20 ta futbol komandasi bor. Har bir komanda o'z maydonida va raqib maydonida bir martadan o'yin o'tkazadi. Butun mavsum davomida jami nechta o'yin bo'ladi?
18. Noldan farqli turli yettita raqam ishtirokida nechta turli raqamli 5 xonali son hosil qilish mumkin?
19. Noldan farqli turli yettita raqam ishtirokida nechta 4 xonali son hosil qilish mumkin?
20. Talaba 4 ta fan bo'yicha qo'shimcha tayyorlanish uchun ularning har biriga haftaning bir kunini ajratmoqchi bo'ldi. Talaba hafta kunlarini fanlarga necha usulda taqsimlashi mumkin?
21. Guruhdagi 22 ta talabadan sardor, uning muovini va devoriy gazeta muxbirini saylash kerak. Shu uchta talabani necha usul bilan saylash mumkin?
22. Guruhdagi 26 ta talabadan faqat 6 kishilik voleybol komandasi tuzish kerak. Jami necha usul bilan komanda tuzish mumkin ?
23. SHaxmat musobaqasida 15 ta talaba qatnashayapti. Talabalar o'zaro ikki martadan uchrashishsa, jami nechta partiya o'ynaladi?
24. Engil atletika musobaqalarida 13 ta sportchi ishtirok etadi. Oltin, kumush va bronza medallarini necha xil usul bilan o'zaro bo'lishib olinishi mumkin?
25. Guruhdagi 15 ta talabadan 6 tasi haftaning 6 kunida navbatchilik qilishi kerak. Bu grafikni necha usul bilan tuzish mumkin?
26. Guruhdagi 20 ta talabadan 12 tasi o'g'il bola. Tennis musobaqasida qatnashish uchun 3 ta o'g'il bola va 2 ta qizdan iborat komandani necha usul bilan tuzish mumkin?

27. Talaba 6 ta kitobdan 4 tasini necha usul bilan ajratishi mumkin?
28. Turli rangdagi 5 to'p mato bor. Bu matolardan har bir mato faqat bitta polosani egallaydigan qilib nechta turli besh rangli bayroqlar tayyorlash mumkin?
29. Shaxmat musobaqasida 7 tadan o'yinchisi bor ikkita komanda qatnashayapti. O'tkazilishi mumkin bo'lgan partiyalar soni nechta?
30. Aylanadagi ixtiyoriy 15 ta nuqtadan, uchlari shu nuqtalarda bo'lgan nechta uchburchak o'tkazish mumkin?

### III. Bog'liqsiz sinovlar ketma-ketligiga doir masalalar.

1-30 masalalarda har bir sinovda hodisaning ro'y berish ehtimoli  $p$  ga teng ekanini bilgan holda  $n$  ta bog'liq bo'lmagan sinovlarda hodisaning:

- a) rosa  $k$  marta;
- b) kamida  $k$  marta;
- v) ko'pi bilan  $k$  marta;
- g) hech bo'lmaganda bir marta ro'y berish ehtimolini toping.

- |              |          |             |              |          |            |
|--------------|----------|-------------|--------------|----------|------------|
| 1. $n = 5,$  | $k = 3,$ | $p = 0,9.$  | 16. $n = 7,$ | $k = 3,$ | $p = 0,5.$ |
| 2. $n = 6,$  | $k = 3,$ | $p = 0,9.$  | 17. $n = 6,$ | $k = 2,$ | $p = 0,3.$ |
| 3. $n = 4,$  | $k = 1,$ | $p = 0,6.$  | 18. $n = 6,$ | $k = 5,$ | $p = 0,8.$ |
| 4. $n = 3,$  | $k = 2,$ | $p = 0,75.$ | 19. $n = 5,$ | $k = 4,$ | $p = 0,8.$ |
| 5. $n = 6,$  | $k = 2,$ | $p = 0,5.$  | 20. $n = 5,$ | $k = 3,$ | $p = 0,6.$ |
| 6. $n = 3,$  | $k = 1,$ | $p = 0,4.$  | 21. $n = 4,$ | $k = 2,$ | $p = 0,9.$ |
| 7. $n = 7,$  | $k = 4,$ | $p = 0,5.$  | 22. $n = 4,$ | $k = 3,$ | $p = 0,8.$ |
| 8. $n = 7,$  | $k = 2,$ | $p = 0,2.$  | 23. $n = 5,$ | $k = 2,$ | $p = 0,7.$ |
| 9. $n = 6,$  | $k = 2,$ | $p = 0,2.$  | 24. $n = 5,$ | $k = 3,$ | $p = 0,6.$ |
| 10. $n = 6,$ | $k = 3,$ | $p = 0,5.$  | 25. $n = 4,$ | $k = 2,$ | $p = 0,5.$ |
| 11. $n = 6,$ | $k = 4,$ | $p = 0,95.$ | 26. $n = 4,$ | $k = 3,$ | $p = 0,4.$ |
| 12. $n = 5,$ | $k = 4,$ | $p = 0,95.$ | 27. $n = 5,$ | $k = 2,$ | $p = 0,3.$ |
| 13. $n = 5,$ | $k = 2,$ | $p = 0,6.$  | 28. $n = 5,$ | $k = 3,$ | $p = 0,4.$ |
| 14. $n = 5,$ | $k = 1,$ | $p = 0,5.$  | 29. $n = 4,$ | $k = 2,$ | $p = 0,3.$ |
| 15. $n = 6,$ | $k = 1,$ | $p = 0,2.$  | 30. $n = 4,$ | $k = 3,$ | $p = 0,2.$ |

### IV. Ehtimolliklarni qo'shish va ko'paytirish teoremlari bo'yicha masalalar.

1. Ikkita ovchi bir paytda bir-biriga bog'liq bo'lmagan holda quyonga qarata o'q uzishdi. Ovchilardan hech bo'lmaganda biri nishonga tegsa, quyon otib olingan bo'ladi. Birinchi ovchining nishonga urish ehtimolligi 0,8 ga, ikkinchisniki 0,75 ga teng bo'lsa, quyonni otib olish ehtimolligini toping.
2. Komandada 12 sportchi bo'lib, ularning 5 tasi sport ustasi. Sportchilar ichidan qur'a tashlash orqali uch sportchi tanlandi. Tanlangan sportchilarning hammasi sport ustasi bo'lish ehtimolligini toping.
3. Talaba o'ziga kerakli formulani 3 ta kitobdan qidiradi. Formula birinchi, ikkinchi, uchinchi kitobda bo'lish ehtimolliklari mos ravishda 0,6; 0,7 va 0,8 ga teng. Formula faqat bitta kitobda bo'lish ehtimolligini toping.
4. Talaba o'ziga kerakli formulani 3 ta kitobdan qidiradi. Kerakli formula birinchi, ikkinchi, uchinchi kitobda bo'lish ehtimolliklari mos ravishda 0,3; 0,4 va 0,5 ga teng. Formula faqat ikkita kitobda bo'lish ehtimolligini toping.

5. Talaba o`ziga kerakli formulani 3 ta kitobdan qidiradi. Formula birinchi, ikkinchi, uchinchi kitobda bo`lish ehtimolliklari ravishda 0,2 ; 0,3 va 0,4 ga teng. Formula uchala kitobda bo`lish ehtimoligini toping.
6. Talaba programmadagi 50 savoldan 30 tasini biladi. Har bir imtihon bileti uchta savoldan tuzilgan. Talaba biletidagi uchta savolni bilish ehtimoligini toping.
7. Talaba programmadagi 45 savoldan 30 tasini biladi. Har bir imtihon bileti uchta savoldan tuzilgan. Talaba biletidagi faqat ikkita savolni bilish ehtimoligini toping.
8. Talaba programmadagi 45 savoldan 30 tasini biladi. Har bir imtihon bileti uchta savoldan tuzilgan. Talaba faqat bitta savolni bilish ehtimoligini toping.
9. Avariya yuz berganligi xaqida signal berish uchun ikkita erkli ishlaydigan signalizator o`rnatilgan. Ularning ishlash ehtimolliklari birinchisi uchun 0,95 ga, ikkinchisi uchun 0,9 ga teng. Avariya yuz berganda faqat bitta signalizator ishlay boshlash ehtimolini toping.
10. Ikki mergan nishonga qarata o`q uzmoqda. Bitta o`q uzishda nishonga tekkizish ehtimoli birinchi mergan uchun 0,7, ikkinchi mergan uchun 0,8 ga teng. Bir yo`la bittadan o`q uzishda merganlardan faqat bittasining nishonga tekkizish ehtimoligini topilsin.
11. Ikkita to`pdan bir yo`la o`q uzishda nishonga faqat bitta o`q tegish ehtimoli 0,38 ga teng. Agar ikkinchi to`pdan bitta otishda o`qning nishonga tegish ehtimoligini 0,8 ga teng bo`lsa, birinchi to`pdan otilgan o`qning nishonga tegish ehtimolini toping.
12. Tanga 5 marta tashlandi. Gerbli tomon ikki martadan kam tushish ehtimoligini toping.
13. A hodisa kamida 4 marta ro`y bergan holda V hodisa ro`y beradi. Agar har birida A hodisaning ro`y berish ehtimoli 0,8 ga teng bo`lgan 5 ta erkli sinov o`tkaziladigan bo`lsa, V hodisaning ro`y berish ehtimolini toping.
14. Bitta o`q uzilganda nishonga tegish ehtimoli 0,8 ga teng. 100 ta o`q uzilganda roppa-rosa 75 ta o`qning nishonga tegish ehtimolini toping.
15. Biror qurilmaning 14 ta elementining har biri sinovlanadi. Element-ning sinovga bardosh berish ehtimoli 0,8 ga teng. Sinovga bardosh beradigan elementlarning eng katta ehtimollik sonini toping.
16. 10 ta detal berilgan. Detailning standart bo`lish ehtimoli 0,75 ga teng. Standart deb tan olinadigan detallarning eng katta ehtimollik sonini toping.
17. Ikki mergan nishonga qarata o`q uzishmoqda. Bitta o`q uzishda birinchi merganning nishonga tekkiza olish ehtimoli 0,8 ga, ikkinchisidiki esa 0,6 ga teng. Agar merganlar bir yo`la 25 martadan o`q uzishsa, nishonga bir marta ham o`q tegmaslikning eng katta ehtimollik sonini toping.
18. Ikki to`pdan nishonga bir yo`la bittadan o`q uzilgan. Nishonga tekkizish ehtimoli birinchi to`p uchun 0,8 ga, ikkinchi to`p uchun 0,9 ga teng. Nishonga 2 ta o`q tegish ehtimolini toping.
19. Yashikda 6 ta shar bor. Ulardan 4 tasi yashil. Tavakkaliga 2 ta shar olingan. X diskret tasodifiy miqdor olingan sharlar orasidagi yashil sharlar sonining taqsimot qonunini tuzing.
20. 10 ta shar solingan idishda 5 ta ko`k shar bor. Tavakkal 3 ta shar olingan. SHarlar orasidagi ko`k sharlar sonining taqsimot qonunini tuzing.
21. Darslik 1000 tirajda bosib chiqarilgan. Darslikning varaqlari noto`g`ri yig`ilgan bo`lish ehtimoli 0,001 ga teng. Beshta sifatsiz kitob bo`lish ehtimolini toping.
22. Qurilma bir-biridan erkli ishlaydigan 100 ta elementdan iborat. Istalgan elementning t vaqt davomida ishdan chiqish ehtimoli 0,002 ga teng. t vaqt davomida rosa 2 ta elementning ishdan chiqish ehtimolini toping.
23. Har bir otishda o`qning nishonga tegish ehtimoli 0,8 ga teng. Ixtiyorimizda ikkita o`q bor. Agar otish birinchi tekkungacha olib borilsa: a) bitta o`qning sarf bo`lish; b) ikkita o`qning sarf bo`lish ehtimolini toping.
24. Uchta mergan bir nishonga qarata o`q uzmoqda. Merganlarni nishonga tekkiza olish ehtimolliklari mos ravishda 0,6 ; 0,7 va 0,75 ga teng. Merganlar bir martadan o`q uzgan bo`lsa, aqalli bittasining nishonga tekkizish ehtimoligini topilsin.
25. Uchta kuti bo`lib: birinchisida 1 ta oq va 2 ta qora, ikkinchisida 5 ta oq va 2 ta qora, uchinchisida bir dona oq shar bor. Tavakkal tanlangan yashikdan olingan sharni oq shar bo`lish ehtimoligini toping.

26. Tavakkaliga olingan ikki xonali sonni 2 ga yoki 5 ga bo`linish ehtimolini toping.
27. Yashikda 10 ta detal bo`lib, 4 tasi bo`yalgan. Tavakkal olingan 3 ta detal orasida aqalli bittasini bo`yalgan bo`lish ehtimolini toping.
28. Elektr zanjiriga erkli ishlaydigan 3 ta element ketma-ket ulangan. Birinchi, ikkinchi va uchinchi elementlarning buzilish ehtimolliklari mos ravishda 0,1; 0,15 va 0,2 ga teng. Zanjirda tok bo`lmaslik ehtimolini toping.
29. Avariya yuz berganligi xaqida signal berish uchun uchta erkli ishlaydigan signalizator o`rnatilgan. Ularning ishlash ehtimolliklari birinchisi uchun 0,85 ga, ikkinchisi uchun 0,9 va uchinchisi uchun 0,8 ga teng. Avariya yuz berganda faqat bitta signalizator ishlay boshlash ehtimolini toping.
30. Avariya yuz berganligi xaqida signal berish uchun uchta erkli ishlaydigan signalizator o`rnatilgan. Ularning ishlash ehtimolliklari birinchisi uchun 0,85 ga, ikkinchisi uchun 0,9 va uchinchisi uchun 0,8 ga teng. Avariya yuz berganda faqat ikkita signalizator ishlay boshlash ehtimolini toping.

**V. a)  $x_1$  va  $x_2$  qiymatlarni qabul qilishi mumkin (bunda  $x_1 < x_2$ ) bo`lgan diskret tasodifiy miqdor  $X$  ning taqsimot qonunini toping.  $M(X)$  matematik kutilish,  $D(X)$  dispersiya va mumkin bo`lgan  $x_1$  qiymatining  $p_1$  ehtimoli ma`lum.**

1.  $p_1 = 0,9$ ,  $M(X) = 3,1$ ,  $D(X) = 0,09$ .
2.  $p_1 = 0,8$ ,  $M(X) = 3,2$ ,  $D(X) = 0,16$ .
3.  $p_1 = 0,7$ ,  $M(X) = 3,3$ ,  $D(X) = 0,21$ .
4.  $p_1 = 0,6$ ,  $M(X) = 3,4$ ,  $D(X) = 0,24$ .
5.  $p_1 = 0,5$ ,  $M(X) = 3,5$ ,  $D(X) = 0,25$ .
6.  $p_1 = 0,4$ ,  $M(X) = 3,6$ ,  $D(X) = 0,24$ .
7.  $p_1 = 0,3$ ,  $M(X) = 3,7$ ,  $D(X) = 0,21$ .
8.  $p_1 = 0,2$ ,  $M(X) = 3,8$ ,  $D(X) = 0,16$ .
9.  $p_1 = 0,1$ ,  $M(X) = 3,9$ ,  $D(X) = 0,09$ .
10.  $p_1 = 0,9$ ,  $M(X) = 2,2$ ,  $D(X) = 0,36$ .
11.  $p_1 = 0,1$ ,  $M(X) = 1,9$ ,  $D(X) = 0,09$ .
12.  $p_1 = 0,3$ ,  $M(X) = 1,7$ ,  $D(X) = 0,21$ .
13.  $p_1 = 0,5$ ,  $M(X) = 1,5$ ,  $D(X) = 0,25$ .
14.  $p_1 = 0,7$ ,  $M(X) = 1,3$ ,  $D(X) = 0,21$ .
15.  $p_1 = 0,9$ ,  $M(X) = 1,1$ ,  $D(X) = 0,09$ .

**b)  $X$  tasodifiy miqdorning  $F(x)$  taqsimot funksiyasi berilgan bo`lsa, quyidagilarni aniqlang:**

- a)  $f(x)$  zichlik funksiya,
- b)  $M(x)$  matematik kutilma,
- v)  $D(x)$  dispersiya,
- g)  $\sigma(x)$  o`rta kvadratik chetlanish,
- d)  $P(0.3 < x < 0.7)$  ehtimollik.

$$16. F(x) = \begin{cases} 0, & \text{агар } x \leq 0 \text{ бо'lsa,} \\ 3x^2 + 2x, & \text{агар } 0 < x \leq \frac{1}{3} \text{ бо'lsa,} \\ 0, & \text{агар } x > \frac{1}{3} \text{ бо'lsa.} \end{cases}$$

$$17. F(x) = \begin{cases} 0, & \text{агар } x \leq 2 \text{ бо'lsa,} \\ \frac{1}{2}x - 1, & \text{агар } 2 < x \leq 4 \text{ бо'lsa,} \\ 1, & \text{агар } x > 4 \text{ бо'lsa.} \end{cases}$$

$$18. F(x) = \begin{cases} 0, & \text{агар } x \leq 0 \text{ бо'lsa,} \\ \frac{x^2}{9}, & \text{агар } 0 < x \leq 3 \text{ бо'lsa,} \\ 1, & \text{агар } x > 3 \text{ бо'lsa.} \end{cases}$$

$$19. F(x) = \begin{cases} 0, & \text{агар } x \leq 0 \text{ бо'lsa,} \\ \frac{x^2}{4}, & \text{агар } 0 < x \leq 2 \text{ бо'lsa,} \\ 1, & \text{агар } x > 2 \text{ бо'lsa.} \end{cases}$$

$$20. F(x) = \begin{cases} 0, & \text{агар } x \leq -\frac{\pi}{2} \text{ бо'lsa,} \\ \cos x, & \text{агар } -\frac{\pi}{2} < x \leq 0 \text{ бо'lsa,} \\ 1, & \text{агар } x > 0 \text{ бо'lsa.} \end{cases}$$

$$21. F(x) = \begin{cases} 0, & \text{агар } x \leq 0 \text{ бо'lsa,} \\ 2 \sin x, & \text{агар } 0 < x \leq \frac{\pi}{6} \text{ бо'lsa,} \\ 1, & \text{агар } x > \frac{\pi}{6} \text{ бо'lsa.} \end{cases}$$

$$22. F(x) = \begin{cases} 0, & \text{агар } x \leq \frac{3}{4}\pi \text{ бо'lsa,} \\ \cos 2x, & \text{агар } \frac{3}{4} < x \leq \pi \text{ бо'lsa,} \\ 1, & \text{агар } x > \pi \text{ бо'lsa.} \end{cases}$$

$$23. F(x) = \begin{cases} 0, & \text{агар } x \leq 1 \text{ бо'lsa,} \\ \frac{x^2}{2} - \frac{x}{2}, & \text{агар } 1 < x \leq 2 \text{ бо'lsa,} \\ 1, & \text{агар } x > 2 \text{ бо'lsa.} \end{cases}$$

$$24. F(x) = \begin{cases} 0, & \text{агар } x \leq 0 \text{ бо'lsa,} \\ x^2, & \text{агар } 0 < x \leq 1 \text{ бо'lsa,} \\ 1, & \text{агар } x > 1 \text{ бо'lsa.} \end{cases}$$

$$25. F(x) = \begin{cases} 0, & \text{агар } x \leq 0 \text{ бо'lsa,} \\ \frac{x^3}{8}, & \text{агар } 0 < x \leq 2 \text{ бо'lsa,} \\ 1, & \text{агар } x > 2 \text{ бо'lsa,} \end{cases}$$

$$26. F(x) = \begin{cases} 0, & \text{агар } x \leq 0 \text{ бо'lsa,} \\ 2x^2 + x, & \text{агар } 0 < x \leq \frac{1}{2} \text{ бо'lsa,} \\ 1, & \text{агар } x > \frac{1}{2} \text{ бо'lsa.} \end{cases}$$

$$27. F(x) = \begin{cases} 0, & \text{агар } x \leq 3 \text{ бо'lsa,} \\ \frac{1}{3}x - 1, & \text{агар } 3 < x \leq 6 \text{ бо'lsa,} \\ 1, & \text{агар } x > 6 \text{ бо'lsa.} \end{cases}$$

$$28. F(x) = \begin{cases} 0, & \text{агар } x \leq 0 \text{ бо'lsa,} \\ \frac{x^2}{25}, & \text{агар } 0 < x \leq 5 \text{ бо'lsa,} \\ 1, & \text{агар } x > 5 \text{ бо'lsa.} \end{cases}$$

$$29. F(x) = \begin{cases} 0, & \text{агар } x \leq 0 \text{ бо'lsa,} \\ \frac{4x^2}{9}, & \text{агар } 0 < x \leq \frac{3}{2} \text{ бо'lsa,} \\ 1, & \text{агар } x > \frac{3}{2} \text{ бо'lsa.} \end{cases}$$

$$30. F(x) = \begin{cases} 0, & \text{агар } x \leq -\frac{\pi}{6} \text{ бо'lsa,} \\ \cos 3x, & \text{агар } -\frac{\pi}{6} < x \leq 0 \text{ бо'lsa,} \\ 1, & \text{агар } x > 0 \text{ бо'lsa.} \end{cases}$$

# HISOB GRAFIK ISHLARINING TOPSHIRIQLARI

## 1-HISOB-GRAFIK ISHI TOPSHIRIQLARI

### I. Ko'p o'zgaruvchili funksiyalar(1-30).

a) Funksiyaning aniqlanish sohasini toping va chizmada tasvirlang.

b) Sirtga  $M_0(x_0; y_0; z_0)$  nuqtada o'tkazilgan urinma tekislik va normal tenglamalarini tuzing.

1. a)  $z = \ln(x^2 + y^2 - 6) + \sqrt{\ln y}$

b)  $2x^2 + 2y^2 + z^2 + 8xz - z + 6 = 0, M_0(-2;1;1).$

2. a)  $z = \arcsin \frac{x}{y}$

b)  $x^2 - xy - 8x + z^3 - yz - 8 = 0, M_0(2;-3;2).$

3. a)  $z = \frac{\ln(y-1)}{\sqrt{y-x^2+4}}$

b)  $z = x^2 + y^2 - 2xy - x + 2y - 4, M_0(-1;1;3).$

4. a)  $z = \sqrt{(x^2 + y^2 - 1)(4 - x^2 - y^2)}$

b)  $x^2 + y^2 - 2z^2 + xy - 4z - 3xz - 4 = 0, M_0(3;2;1).$

5. a)  $z = \ln(x^2 - 2y + 4) + \sqrt{x}$

b)  $z = x^2 + y^2 - 3xy + 3x - 2y - 5, M_0(-1;2;-1).$

6. a)  $z = \frac{1}{\sqrt{x+y}} + \sqrt{x-y}$

b)  $6xy - 2x^2 - xy^2 - z^2 + 3x = 0, M_0(1;2;3).$

7. a)  $z = \arccos \frac{y}{x+y}$

b)  $x^2 - y^2 + z^2 - yz - 4yx - 8x = 0, M_0(1;-2;-1).$

8. a)  $z = \frac{\ln y}{\sqrt{3-y^2-x^2}}$

b)  $3x^2 - 4xy + 12xz - 3yz + z^2 + 15 = 0, M_0(-1;-1;2).$

9. a)  $z = \frac{1}{\sqrt{x^2 + y^2 - 6}} + \frac{1}{\sqrt{x}}$

b)  $z = x^2 + y^2 + 2xy - 2x - 3y - 8, M_0(2;3;4).$

10. a)  $z = \frac{\sqrt{x^2 - 2y + 4}}{4x}$

b)  $x^2 - xy + xz + 3yz + 2z^2 + 2 = 0, M_0(1;1;-1).$

11. a)  $z = \frac{\ln x}{\sqrt{-y^2 - x^2 + 5}}$

b)  $z = x^2 - y^2 + 6x + 3y - 2xy, M_0(2;3;4).$

12. a)  $z = \frac{e^{\sqrt{x^2 + y^2 - 1}}}{\sqrt{x+y}}$

b)  $x^2 - 2y^2 - 2z^2 - xy - yz + 3 = 0, M_0(2;1;1).$

13. a)  $z = \frac{\arcsin(x-y)}{\sqrt{x^2 - y - 1}}$

b)  $x^3 + y^3 - z^2 - 2xyz - 5xy - 4y + 2 = 0, M_0(2;1;-3).$

14. a)  $z = \sqrt{4x - x^2 - y^2}$

b)  $z = 2x^2 - 3y^2 + 4x - 2y - 10xy, M_0(-1;1;3).$

15. a)  $z = \ln(16 - x^2 - y^2) + \sqrt{\ln x}$

b)  $x^2 + y^2 - z^2 + 2x - 2xy - z = 0, M_0(1;1;-2).$

16. a)  $z = \arccos \frac{2x}{\sqrt{x^2 + y^2}}$

b)  $2x^2 - 3y^2 + xy + 3x - z - y = 0, M_0(1;-1;2).$

17. a)  $z = \frac{\sqrt{xy}}{x^2 + y^2}$

b)  $x^2 + y^2 + z^2 - 4x + 6z + 8 = 0, M_0(2;1;-1).$

18. a)  $z = \sqrt{\ln(8 - x^2 - y^2)}$

b)  $y^2 + z^2 - 4x^2 + 2xy + 3xz - 6 = 0, M_0(1;-2;2).$

19. a)  $z = \arcsin(3x - y)$

b)  $z = x^2 - y^2 - 2xy - x - 2y, M_0(-1;1;1).$

20. a)  $z = \sqrt{y - \sqrt{x}}$

b)  $x^2 + y^2 - 3z^2 + xy + 2z = 0, M_0(1;0;1).$



$$21. a) z = \sqrt{1-x^2} + \sqrt{y^2-1}$$

$$b) z = 2x^2 + y^2 + 4xy - 5x - 10, \quad M_0(1;-7;8).$$

$$22. a) z = \frac{\sqrt{3x-4y}}{x^2+y^2+2}$$

$$b) x^2 + y^2 + z^2 - 6x + 4z - 4xz = 0, \quad M_0(1;2;-1).$$

$$23. a) z = \arcsin \frac{x}{y+1}$$

$$b) x^2 + y^2 + z^2 + 6x + 4y - 8 = 0, \quad M_0(1;-1;2).$$

$$24. a) z = \sqrt{8x-x^2+y^2}$$

$$b) y^2 - 2x^2 - z^2 - y + 4z + 13 = 0, \quad M_0(2;1;-1).$$

$$25. a) z = 3 + \sqrt{-x^2 - y^2 + 2xy}$$

$$b) z = x^2 + y^2 - 4xy + 3y - 15, \quad M_0(3;-1;4).$$

$$26. a) z = \ln \left( 1 - \frac{x^2}{4} - \frac{y^2}{9} \right)$$

$$b) x^2 + y^2 + 2xz - z^2 + x - 2z - 2 = 0, \quad M_0(1;1;1).$$

$$27. a) z = \sqrt{\frac{x^2 + y^2 + 2xy}{x^2 + y^2 - 2xy}}$$

$$b) x^2 + y^2 - z^2 + 6xy - z - 6 = 0, \quad M_0(1;1;-2).$$

$$28. a) z = \frac{\ln 3x}{\sqrt{x^2 + y^2 - 9}}$$

$$b) 4x^2 - z^2 + 4xy - yz + 3z - 9 = 0, \quad M_0(-2;1;1).$$

$$29. a) z = \frac{\sqrt{x^2 - y^2}}{xy}$$

$$b) z = y^2 - x^2 + 2xy - 3y + 5x - 4, \quad M_0(1;-1;2).$$

$$30. a) z = \sqrt{25-x^2-y^2} + \sqrt{xy}$$

$$b) x^2 + y^2 + xz - yz - 3xy - 2 = 0, \quad M_0(4;1;-1).$$

## 2-HISOB-GRAFIK ISHI TOPSHIRIQLARI

### NAMUNAVIY VARIANT YECHIMI

1. Ikki karrali integralni hisoblang.

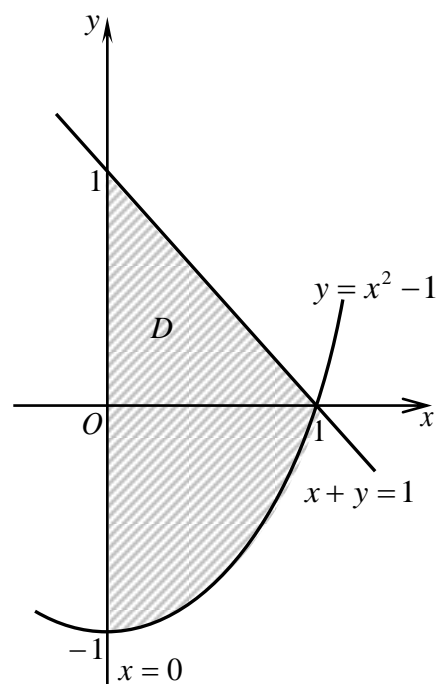
$$\iint_D (x^2 + 3y) dx dy, \quad D: x + y = 1, \quad y = x^2 - 1, \quad x \geq 0.$$

*Yechish.*  $D$  integrallash sohasi shaklda keltirilgan. Agar ichki integrallash  $y$  bo'yicha va tashqi integrallash  $x$  bo'yicha bajarilsa berilgan ikki karrali integral bitta takroriy integral bilan ifodalanadi. Integralni hisoblaymiz:

$$\begin{aligned} \iint_D (x^2 + 3y) dx dy &= \int_0^1 dx \int_{x^2-1}^{1-x} (x^2 + 3y) dy = \\ &= \int_0^1 \left( x^2 y + \frac{3}{2} y^2 \right) \Big|_{x^2-1}^{1-x} dx = \\ &= \int_0^1 \left( x^2 - x^3 - x^4 + x^2 + \frac{3}{2} (1 - 2x + x^2 - x^4 + 2x^2 - 1) \right) dx = \\ &= \frac{1}{2} \int_0^1 (4x^2 - 2x^3 - 2x^4 + 9x^2 - 3x^4 - 6x) dx = \end{aligned}$$

$$= \frac{1}{2} \left( \frac{13}{3} x^3 - \frac{1}{2} x^4 - x^5 - 3x^2 \right) \Big|_0^1 = -\frac{1}{12}.$$

2. Uch karrali integrallarni hisoblang.



$$\iiint_V (3x^2 + 2y + z) dx dy dz, \quad V: 0 \leq x \leq 1, 0 \leq y \leq 1, -1 \leq z \leq 3.$$

*Yechish.* Berilgan to'g'ri burchakli paralleliped uchun topamiz:

$$\begin{aligned} \iiint_V (3x^2 + 2y + z) dx dy dz &= \int_0^1 dx \int_0^1 dy \int_{-1}^3 (3x^2 + 2y + z) dz = \\ &= \int_0^1 dx \int_0^1 \left( (3x^2 + 2y)z + \frac{z^2}{2} \right) \Big|_{-1}^3 dy = 4 \int_0^1 dx \int_0^1 (3x^2 + 2y + 1) dy = \\ &= 4 \int_0^1 ((3x^2 + 1)y + y^2) \Big|_0^1 dx = 4 \int_0^1 (3x^2 + 2) dx = 4(x^3 + 2x) \Big|_0^1 = 12. \end{aligned}$$

$$3. \int_L \sqrt{2y} dl, \quad L: x = 2(t - \sin t), \quad y = 2(1 - \cos t) \text{ sikloidaning bir arkasi.}$$

*Yechish.* Sikloidaning parametrik tenglamasidan topamiz:

$$x'_t = 2(1 - \cos t), \quad y'_t = 2 \sin t,$$

$$dl = \sqrt{4(1 - \cos t)^2 + 4 \sin^2 t} dt = 2\sqrt{2} \sqrt{1 - \cos t} dt.$$

$$\begin{aligned} \text{U holda } \int_L \sqrt{2y} dl &= \int_0^{2\pi} \sqrt{2 \cdot 2(1 - \cos t)} 2\sqrt{2} \sqrt{1 - \cos t} dt = \\ &= 4\sqrt{2} \int_0^{2\pi} (1 - \cos t) dt = 4\sqrt{2} (t - \sin t) \Big|_0^{2\pi} = 8\pi\sqrt{2}. \end{aligned}$$

4. Ikkinchi tur egri chiziqli integrallarni hisoblang.

$$\int_L y^2 dx + x^2 dy, \quad L: x = a \cos t, \quad y = b \sin t \text{ ellipsning soat strelkasi yo'nalishida aylanib}$$

o'tishdagi yuqori yoyi.

*Yechish.* Ellipsning parametrik tenglamasiga ko'ra  $dx = -a \sin t dt$ ,  $dy = b \cos t dt$ .

Bunda soat strelkasi yo'nalishida  $t$  parametr  $\pi$  dan 0 gacha o'zgaradi.

$$\begin{aligned} \text{U holda } \int_L y^2 dx + x^2 dy &= \int_{\pi}^0 (-b^2 \sin^2 t a \cos t + a^2 \cos^2 t b \sin t) dt = \\ &= \int_{\pi}^0 b^2 a (1 - \cos^2 t) d(\cos t) + \int_{\pi}^0 a^2 b (1 - \sin^2 t) d(\sin t) = \\ &= b^2 a \left( \cos t - \frac{1}{3} \cos^3 t \right) \Big|_{\pi}^0 + a^2 b \left( \sin t - \frac{1}{3} \sin^3 t \right) \Big|_{\pi}^0 = \frac{4}{3} ab^2. \end{aligned}$$

### Quyidagi topshiriqlarni bajaring.

1. Ikki karrali integralni hisoblang.
2. Uch karrali integrallarni hisoblang.
3. Birinchi tur egri chiziqli integralni hisoblang.
4. Ikkinchi tur egri chiziqli integrallarni hisoblang.

*1-variant*

$$1. \iint_D xy^3 dx dy, \quad D: y^2 = 1 - x, \quad x \geq 0.$$

2.  $\iiint_V (x + 2y) dx dy dz$ ,  $V: z = x^2 + 3y^2$ ,  $y = x$ ,  $x = 1$ ,  $y = 0$ ,  $z = 0$ .
3.  $\int_L y dl$ ,  $L: x = \cos^3 t$ ,  $y = \sin^3 t$  astroidaning  $A(1;0)$  va  $B(0;1)$  nuqtalar orasidagi yoyi.
4.  $\int_L (xy - y^2) dx + x dy$ ,  $L: y = 2x^2$  parabolaning  $O(0;0)$  nuqtadan  $B(1;2)$  nuqttagacha bo'lgan yoyi.

*2-variant*

1.  $\iint_D \frac{dx dy}{\sqrt{1 + x^2 + y^2}}$ ,  $D: x^2 + y^2 = 3$ .
2.  $\iiint_V 2xy^2 z^2 dx dy dz$ ,  $V: 0 \leq x \leq 3$ ,  $-2 \leq y \leq 0$ ,  $1 \leq z \leq 2$ .
3.  $\int_L \frac{dl}{x - y}$ ,  $L: A(0;4)$  va  $B(4;0)$  nuqtalarni tutashtiruvchi to'g'ri chiziq kesmasi.
6.  $\oint_L x dy$ ,  $L: x^2 + y^2 = R^2$  aylananing musbat yo'nalishda aylanib o'tishdagi yoyi.

*3-variant*

1.  $\iint_D (y^2 + x^2) dx dy$ ,  $D: x = 1$ ,  $x = y^2$ .
2.  $\iiint_V (x + 2y + 3z^2) dx dy dz$ ,  $V: -1 \leq x \leq 2$ ,  $0 \leq y \leq 1$ ,  $1 \leq z \leq 2$ .
3.  $\oint_L \sqrt{x^2 + y^2} dl$ ,  $L: x^2 + y^2 = 2x$  aylana.
4.  $\int_L xye^x dx + (x - 1)e^x dy$ ,  $L: A(0;2)$  va  $B(1;2)$  nuqtalarni tutashtiruvchi  $AB$  to'g'ri chiziq qismi.

*4-variant*

1.  $\iint_D (x^3 - 2y) dx dy$ ,  $D: y = x^2 - 1$ ,  $x \geq 0$ ,  $y \leq 0$ .
2.  $\iiint_V \sqrt{x^2 + y^2 + z^2} dx dy dz$ ,  $V: x^2 + y^2 + z^2 = 9$ ,  $x \geq 0$ ,  $y \geq 0$ ,  $z \geq 0$ .
3.  $\int_L \frac{dl}{\sqrt{x^2 + y^2}}$ ,  $L: r = 2(1 + \cos \varphi)$  ( $0 \leq \varphi \leq \frac{\pi}{2}$ ) kardioida.
4.  $\int_L 2xy dx - x^2 dy$ ,  $L: x = 2y^2$  parabolaning  $O(0;0)$  nuqtadan  $B(2;1)$  nuqttagacha bo'lgan yoyi.

*5-variant*

1.  $\iint_D xy^2 dx dy$ ,  $D: y = x^2$ ,  $y = 2x$ .
2.  $\iiint_V (1 + 2z) dx dy dz$ ,  $V: y = 4x$ ,  $y = 0$ ,  $x = 1$ ,  $z = \sqrt{xy}$ ,  $z = 0$ .
3.  $\int_L \frac{z^2 dl}{x^2 + y^2}$ ,  $L: x = 2\cos t$ ,  $y = 2\sin t$ ,  $z = 2t$  vint chizig'ining birinchi o'rami.

4.  $\int_L (x^2 + y^2)dx + xydy$ ,  $L: y = e^x$  chiziqning  $A(0;1)$  nuqtadan  $B(1;e)$  nuqttagacha bo'lgan yoyi.

6-variant

1.  $\iint_D x(2x + y)dxdy$ ,  $D: y = 1 - x^2, y \geq 0$ .
2.  $\iiint_V (x^2 + 2y^2 - z)dxdydz$ ,  $V: 0 \leq x \leq 1, 0 \leq y \leq 3, -1 \leq z \leq 2$ .
3.  $\int_L ydl$ ,  $L: y^2 = 2x$  parabolaning  $A(0;0)$  va  $B(1;\sqrt{2})$  nuqtalar orasidagi yoyi.
4.  $\int_L 2y \sin 2x dx - \cos 2x dy$ ,  $L: A\left(\frac{\pi}{4}; 2\right)$  va  $B\left(\frac{\pi}{6}; 1\right)$  nuqtalarni tutashtiruvchi  $AB$  to'g'ri chiziq kesmasi.

7-variant

1.  $\iint_D \frac{dxdy}{\sqrt{x^2 + y^2}}$ ,  $D: x^2 + y^2 = 4$ .
2.  $\iiint_V x^3 yz dxdydz$ ,  $V: -1 \leq x \leq 2, 1 \leq y \leq 3, 0 \leq z \leq 1$ .
3.  $\int_L \frac{dl}{\sqrt{8 - x^2 - y^2}}$ ,  $L: A(0;0)$  va  $B(2;2)$  nuqtalarni tutashtiruvchi to'g'ri chiziq kesmasi.
4.  $\int_L y^2 dx + x^2 dy$ ,  $L: x = 5 \cos t, y = 2 \sin t$  ellipsning musbat yo'nalishda aylanib o'tishdagi yuqori yoyi.

8-variant

1.  $\iint_D e^{x^2 + y^2} \sqrt{x^2 + y^2} dxdy$ ,  $D: x^2 + y^2 = 9$ .
2.  $\iiint_V 3(2y + 3x)dxdydz$ ,  $V: y = x, x = 0, x = 1, z = x^2 + y^2, z = 0$ .
3.  $\int_L \frac{dl}{x^2 + y^2 + z^2}$ ,  $L: x = \cos t, y = \sin t, z = t$  vint chizig'ining birinchi o'rami.
4.  $\int_L 2xy dx - x^2 dy + z dz$ ,  $L: O(0;0;0)$  va  $B(2;1;-1)$  nuqtalarni tutashtiruvchi  $OB$  to'g'ri chiziq kesmasi.

9-variant

1.  $\iint_D (x + 1)y^2 dxdy$ ,  $D: y = 3x^2, y = 3$ .
2.  $\iiint_V (x + y + z)dxdydz$ ,  $V: x + y + z = 1, x \geq 0, y \geq 0, z \geq 0$ .
3.  $\int_L (x^2 + y^2)^2 dl$ ,  $L: x = 3 \cos t, y = 3 \sin t$  aylana.
4.  $\int_L (2a - y)dx + xdy$ ,  $L: x = a(t - \sin t), y = a(1 - \cos t) (0 \leq t \leq 2\pi)$  sikloidaning birinchi arkasi.

10-variant

1.  $\iint_D \frac{y^2}{x^2} dxdy$ ,  $D: y = x, xy = 1, y = 2$ .

$$2. \iiint_V x^2 y^2 z^3 dx dy dz, V: -1 \leq x \leq 3, 0 \leq y \leq 2, 1 \leq z \leq 2.$$

$$3. \int_L (4\sqrt[3]{x} - 3\sqrt[3]{y}) dl, L: x = \cos^3 t, y = \sin^3 t \text{ astroidaning } A(1;0) \text{ va } B(0;1)$$

nuqtalar orasidagi yoyi.

$$4. \int_L \sin y dx + \sin x dy, L: A(0;\pi) \text{ va } B(\pi;0) \text{ nuqtalarni tutashtiruvchi } AB \text{ to'g'ri chiziq kesmasi.}$$

#### 11-variant

$$1. \iint_D x^2(1+3y) dx dy, D: x=0, y^2=2-x.$$

$$2. \iiint_V (x^2 + y^2 + z^2) dx dy dz, V: 0 \leq x \leq 1, -2 \leq y \leq 1, 1 \leq z \leq 3.$$

$$3. \int_L x dl, L: x = \cos^3 t, y = \sin^3 t \text{ astroidaning } A(1;0) \text{ va } B(0;1) \text{ nuqtalar orasidagi yoyi.}$$

$$4. \int_L (xy - 2) dx + y^2 x dy, L: A(2;1) \text{ va } B(1;2) \text{ nuqtalarni tutashtiruvchi } AB \text{ to'g'ri chiziq kesmasi.}$$

#### 12-variant

$$1. \iint_D (x + y^2) dx dy, D: y = x^2, x = y^2.$$

$$2. \iiint_V 8x^2 y z^2 dx dy dz, V: -2 \leq x \leq 1, 0 \leq y \leq 2, -1 \leq z \leq 3.$$

$$3. \oint_L (x + y) dl, L: x^2 + y^2 = 2ay \text{ aylana.}$$

$$4. \int_L y dx, L: y = \cos x \text{ cosinusoidaning } O(\pi;-1) \text{ nuqtadan } B(0;1) \text{ nuqttagacha bo'lgan yoyi.}$$

#### 13-variant

$$1. \iint_D \frac{dx dy}{\sqrt{1+x^2+y^2}}, D: x^2 + y^2 = 8.$$

$$2. \iiint_V (2 + 3y^3) dx dy dz, V: x = 4y, x = 0, y = 1, z = \sqrt{xy}, z = 0.$$

$$3. \oint_L \sqrt{x^2 + y^2} dl, L: x^2 + y^2 = 4x \text{ aylana.}$$

$$4. \oint_L (x - y) dx + (x + y) dy, L: x = 3 \cos t, y = 2 \sin t \text{ ellipsning musbat yo'nalishda aylanib o'tishdagi yoyi.}$$

#### 14-variant

$$1. \iint_D \frac{xy dx dy}{x^2 + y^2}, D: x^2 + y^2 = 16.$$

$$2. \iiint_V (x^2 + 2y + z^2) dx dy dz, V: 1 \leq x \leq 2, 0 \leq y \leq 2, -1 \leq z \leq 2.$$

$$3. \int_L \frac{dl}{y - x}, L: A(1;3) \text{ va } B(3;1) \text{ nuqtalarni tutashtiruvchi to'g'ri chiziq kesmasi.}$$

$$4. \oint_L y dx, L: x^2 + y^2 = 16 \text{ aylananing musbat yo'nalishda aylanib o'tishdagi yoyi.}$$

15-variant

1.  $\iint_D xy \, dx \, dy$ ,  $D: \begin{cases} xy = 1 \\ x + y = \frac{5}{2} \end{cases}$ .
2.  $\iiint_V \frac{dx \cdot dy \cdot dz}{(1 + \frac{x}{3} + \frac{y}{4} + \frac{z}{8})^4}$ ,  $V: \begin{cases} \frac{x}{3} + \frac{y}{4} + \frac{z}{8} = 1 \\ x = 0, y = 0, z = 0 \end{cases}$ .
3.  $\int_L xy \, dl$ ,  $L$ -chiziq  $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$  ellipsning birinchi choyrakdagi yoyidan iborat.
4.  $\int_L (x^2 + y^2) \, dx + xy \, dy$ , bu yerda  $L$  chiziq  $y = e^x$  chiziqning  $A(0,1)$  nuqtadan  $B(1;e)$  nuqttagacha bo'lgandan iborat.

16-variant

1.  $\iint_D y(1 + x^2) \, dx \, dy$ ,  $D: y = x^3, y = 3x$ .
2.  $\iiint_V xy^2 z \, dx \, dy \, dz$ ,  $V: -2 \leq x \leq 1, 0 \leq y \leq 2, 0 \leq z \leq 3$ .
3.  $\int_L y \, dl$ ,  $L: y^2 = 2x$  parabolaning  $x^2 = 2y$  parabola kesgan yoyi.
4.  $\int_L (xy - 1) \, dx + x^2 y \, dy$ ,  $L: A(1;0)$  va  $B(0;2)$  nuqtalarni tutashtiruvchi  $AB$  to'g'ri chiziq kesmasi.

17-variant

1.  $\iint_D (xy - 4x^3 y^3) \, dx \, dy$ ,  $D: x = 1, y = x^2, y = -\sqrt{x}$ .
2.  $\iiint_V (x^2 + y^2 + z^2) \, dx \, dy \, dz$ ,  $V: x^2 + y^2 + z^2 = 4, x \geq 0, y \geq 0, z \geq 0$ .
3.  $\int_L x^2 \, dl$ ,  $L: x^2 + y^2 = R^2$  aylananing yuqori yoyi.
4.  $\int_L (xy - y)^2 \, dx + x \, dy$ ,  $L: y = x^2$  parabolaning  $O(0;0)$  nuqtadan  $B(1;1)$  nuqttagacha bo'lgan yoyi.

18-variant

1.  $\iint_D \sqrt{1 - x^2 - y^2} \, dx \, dy$ ,  $D: x^2 + y^2 = 4$ .
2.  $\iiint_V 21xz \, dx \, dy \, dz$ ,  $V: y = x, y = 0, x = 2, z = xy, z = 0$ .
3.  $\oint_L (x^2 + y^2) \, dl$ ,  $L: x^2 + y^2 = 4x$  aylana.
4.  $\oint_L (x^2 y - x) \, dx + (y^2 x - 2y) \, dy$ ,  $L: x = 3 \cos t, y = 2 \sin t$  ellipsning musbat yo'nalishda aylanib o'tishdagi yoyi.

19-variant

1.  $\iint_D y \sin xy \, dx \, dy$ ,  $D: y = \frac{\pi}{2}, y = \pi, x = 1, x = 2$ .

- $\iiint_V (xy - z^2) dx dy dz$ ,  $V: 0 \leq x \leq 1, -1 \leq y \leq 2, 0 \leq z \leq 3$ .
- $\oint_L (x + y) dl$ ,  $L$ : uchlari  $A(1;0)$ ,  $B(0;1)$ ,  $O(0;0)$  nuqtalarda bo'lgan uchburchak konturi.
- $\int_L x dy$ ,  $L$ :  $y = \sin x$  sinusoidaning  $O(\pi;0)$  nuqtadan  $B(0;0)$  nuqtagacha bo'lgan yoyi.

20-variant

- $\iint_D (6xy + 24x^3 y^3) dx dy$ ,  $D: x=1, y=\sqrt{x}, y=-x^2$ .
- $\iiint_V 5xyz^2 dx dy dz$ ,  $V: -1 \leq x \leq 0, 2 \leq y \leq 3, 1 \leq z \leq 2$ .
- $\int_L yx dl$ ,  $L$ :  $y^2 = 6x$  parabolaning  $x^2 = 6y$  parabola kesgan yoyi.
- $\oint_L y dx - x dy$ ,  $L$ :  $r = R$  aylananing musbat yo'nalishda aylanib o'tishdagi yoyi.

21-variant

- $\iint_D x(y-1) dx dy$ ,  $D: y=5x, y=x, x=3$ .
- $\iiint_V (3x^2 + y^2) dx dy dz$ ,  $V: z=10y, x+y=1, x=0, y=0, z=0$ .
- $\int_L y^2 dl$ ,  $L$ :  $x=3(t-\sin t)$ ,  $y=3(1-\cos t)$  sikloidaning bir arkasi.
- $\int_L \cos z dx - \sin x dz$ ,  $L$ :  $A(2;0;-2)$  va  $B(-2;0;2)$  nuqtalarni tutashtiruvchi  $AB$  to'g'ri chiziq kesmasi.

22-variant

- $\iint_D \frac{dx dy}{1+x^2+y^2}$ ,  $D: x^2 + y^2 = 9$ .
- $\iiint_V (x - y - z) dx dy dz$ ,  $V: 0 \leq x \leq 3, 0 \leq y \leq 1, -2 \leq z \leq 1$ .
- $\oint_L xy dl$ ,  $L$ : tomonlari  $x=1, x=-1, y=1, y=-1$  bo'lgan kvadrat konturi.
- $\int_L \frac{y dx + x dy}{x^2 + y^2}$ ,  $L$ :  $A(1;2)$  va  $B(3;6)$  nuqtalarni tutashtiruvchi  $AB$  to'g'ri chiziq kesmasi.

23-variant

- $\iint_D y \cos xy dx dy$ ,  $D: y = \frac{\pi}{2}, y = \pi, x=1, x=2$ .
- $\iiint_V (y^2 + z) dx dy dz$ ,  $V: z=x+y, x+y=1, x=0, y=0, z=0$ .
- $\oint_L \sqrt{x^2 + y^2} dl$ ,  $L: x^2 + y^2 = 2y$  aylana.
- $\int_L (x^2 + y) dx + (x + y^2) dy$ ,  $L: ABC$  siniq chiziq,  $A(2;0), B(5;3), C(5;0)$ .

24-variant

- $\iint_D ye^{\frac{xy}{2}} dx dy$ ,  $D: y = \ln 2, y = \ln 3, x = 2, x = 4$ .
- $\iiint_V y^2 dx dy dz$ ,  $V: z = 2(3x + y), x + y = 1, x = 0, y = 0, z = 0$ .
- $\int_L (x + y) dl$ ,  $L: r^2 = \cos 2\varphi \left( -\frac{\pi}{4} \leq \varphi \leq \frac{\pi}{4} \right)$  Bernulli limniskatasining bo'lagi.
- $\int_L 4x \sin^2 y dx + y \cos 2x dy$ ,  $L: A(0;0)$  va  $B(3;6)$  nuqtalarni tutashtiruvchi  $AB$  to'g'ri chiziq kesmasi.

25-variant

- $\iint_D y^2(1 + 2x) dx dy$ ,  $D: y = 2 - x^2, x = 0$ .
- $\iiint_V (2x - y^2 - z) dx dy dz$ ,  $V: 1 \leq x \leq 5, 0 \leq y \leq 2, -1 \leq z \leq 0$ .
- $\int_L (4\sqrt[3]{x} - 3\sqrt{y}) dl$ ,  $L: A(-1;0)$  va  $B(0;1)$  nuqtalarni tutashtiruvchi to'g'ri chiziq kesmasi.
- $\int_L \frac{x^2 dy - y^2 dx}{3\sqrt[3]{x^5} + \sqrt[3]{y^5}}$ ,  $L: x = 2\cos^3 t, y = 2\sin^3 t$  astroidaning  $A(2;0)$  nuqtadan  $B(0;2)$  nuqttagacha bo'lgan yoyi.

26-variant

- $\iint_D xy^2 dx dy$ ,  $D: y = x, y = 0, x = 1$ .
- $\iiint_V x^2 yz dx dy dz$ ,  $V: -1 \leq x \leq 2, 0 \leq y \leq 3, 2 \leq z \leq 3$ .
- $\int_L (x^2 + y^2) dl$ ,  $L: r = 2$  aylananing birinchi choragi.
- $\int_L xy dx + (y - x) dy$ ,  $L: y = x^3$  kubik parabolaning  $O(0;0)$  nuqtadan  $B(1;1)$  nuqttagacha bo'lgan yoyi.

27-variant

- $\iint_D e^y dx dy$ ,  $D: y = \ln x, y = 0, x = e$ .
- $\iiint_V (1 + 2x^3) dx dy dz$ ,  $V: y = 4x, y = 0, x = 1, z = \sqrt{xy}, z = 0$ .
- $\int_L y dl$ ,  $L: y = x^2$  parabolaning  $A(2;4)$  va  $B(1;1)$  nuqtalar orasidagi yoyi.
- $\int_L y dx - x dy$ ,  $L: x = a \cos^3 t, y = a \sin^3 t \left( 0 \leq t \leq \frac{\pi}{2} \right)$  astroida yoyi.

28-variant

- $\iint_D ye^{2xy} dx dy$ ,  $D: y = \ln 3, y = \ln 4, x = \frac{1}{2}, x = 1$ .
- $\iiint_V (4 + 8x^3) dx dy dz$ ,  $V: y = x, y = 0, x = 1, z = \sqrt{xy}, z = 0$ .



3.  $\oint_L (x - y)dl$ ,  $L: x^2 + y^2 = 2ax$  aylana.
4.  $\oint_L (x + y)dx + (x - y)dy$ ,  $L: x = 2\cos t, y = 3\sin t$  ellipsning musbat yo'nalishda aylanib o'tishdagi yoyi.

*29-variant*

1.  $\iint_D \frac{xydx dy}{x^2 + y^2}$ ,  $D: x^2 + y^2 = 9$ .
2.  $\iiint_V xyz^2 dx dy dz$ ,  $V: 0 \leq x \leq 2, -1 \leq y \leq 0, 0 \leq z \leq 4$ .
3.  $\oint_L \sqrt{z^2 + y^2} dl$ ,  $L: z^2 + y^2 = 4$  aylana.
4.  $\oint_L y \cos x dx + \sin x dy$ ,  $L: uchlari A(1;0), B(0;2), C(2;0)$  nuqtalarda bo'lgan  $ABC$  uchburchakning musbat yo'nalishda aylanib o'tishdagi konturi.

*30-variant*

1.  $\iint_D (y + x^2) dx dy$ ,  $D: y = x^2, x = y^2$ .
2.  $\iiint_V (x^2 + y^2 + z^2) dx dy dz$ ,  $V: 0 \leq x \leq 3, -1 \leq y \leq 2, 0 \leq z \leq 2$ .
3.  $\int_L (x^2 + y^2 + z^2) dl$ ,  $L: x = 4\cos t, y = 4\sin t, z = 3t$  vint chizig'ining birinchi o'rami.
4.  $\oint_L (x^2 - y) dx$ ,  $L: x = 0, y = 0, x = 1, y = 2$  to'g'ri chiziqlardan tuzilgan to'g'ri to'rtburchakning musbat yo'nalishda aylanib o'tishdagi konturi.

### **3-HISOB-GRAFIK ISHI TOPSHIRIQLARI**

I. Quyidagi qatorlarning yig'indisini toping (1-30).

- |  |   |
|--|---|
| <p>1. <math>\sum_{n=1}^{\infty} \frac{1}{n^2 + 29n + 210}</math>;</p>  | <p>7. <math>\frac{1}{1 \cdot 2} + \frac{1}{2 \cdot 3} + \frac{1}{3 \cdot 4} + \frac{1}{4 \cdot 5} + \dots</math></p>                                  |
| <p>2. <math>\sum_{n=1}^{\infty} \frac{1}{n^2 + 3n + 2}</math>;</p>   | <p>8. <math>1 + \frac{1}{3} + \frac{1}{6} + \frac{1}{10} + \frac{1}{15} + \dots</math></p>  |
| <p>3. <math>\sum_{n=1}^{\infty} \frac{1}{n^2 + 31n + 240}</math></p>   | <p>9. <math>\frac{1}{1 \cdot 3 \cdot 5} + \frac{1}{3 \cdot 5 \cdot 7} + \frac{1}{5 \cdot 7 \cdot 9} + \frac{1}{7 \cdot 9 \cdot 11} + \dots</math></p> |
| <p>4. <math>\frac{1}{1 \cdot 3} + \frac{1}{3 \cdot 5} + \frac{1}{5 \cdot 7} + \frac{1}{7 \cdot 9} + \dots</math></p>   | <p>10. <math>\frac{3}{1 \cdot 4} + \frac{5}{4 \cdot 9} + \frac{7}{9 \cdot 16} + \dots</math></p>  |
| <p>5. <math>\frac{1}{1 \cdot 2 \cdot 3} + \frac{1}{2 \cdot 3 \cdot 4} + \frac{1}{3 \cdot 4 \cdot 5} + \dots</math></p> | <p>11. <math>\frac{1}{3} + \frac{1}{8} + \frac{1}{15} + \frac{1}{24} + \dots</math></p>   |
| <p>6. <math>\frac{2}{3} + \frac{1}{3} + \frac{1}{6} + \frac{1}{12} + \frac{1}{24} + \dots</math></p>                   | <p>12. <math>\sum_{n=1}^{\infty} \frac{1}{n^2 + 7n + 12}</math>;</p>  |

$$\begin{aligned}
13. & \sum_{n=1}^{\infty} \frac{1}{4n^2 + 16n + 15}; \\
14. & \sum_{n=1}^{\infty} \frac{1}{n^2 + 15n + 56}; \\
15. & \sum_{n=1}^{\infty} \frac{1}{n^2 + 11n + 30}; \\
16. & \sum_{n=1}^{\infty} \frac{1}{n^2 + 9n + 20}; \\
17. & \sum_{n=1}^{\infty} \frac{1}{n^2 + 13n + 42}; \\
18. & \sum_{n=1}^{\infty} \frac{1}{9n^2 - 3n - 2}; \\
19. & \sum_{n=1}^{\infty} \frac{1}{4n^2 - 1}; \\
20. & \sum_{n=1}^{\infty} \frac{1}{n^2 + 3n + 2}; \\
21. & \sum_{n=1}^{\infty} \frac{1}{n^2 + 5n + 6};
\end{aligned}$$

$$\begin{aligned}
22. & \sum_{n=1}^{\infty} \frac{1}{49n^2 + 7n - 12}; \\
23. & \sum_{n=1}^{\infty} \frac{1}{n^2 + 9n + 20}; \\
24. & \sum_{n=1}^{\infty} \frac{1}{n^2 + 17n + 72}; \\
25. & \sum_{n=1}^{\infty} \frac{1}{n^2 + 19n + 90}; \\
26. & \sum_{n=1}^{\infty} \frac{1}{n^2 + 21n + 110}; \\
27. & \sum_{n=1}^{\infty} \frac{1}{n^2 + 23n + 120}; \\
28. & \sum_{n=1}^{\infty} \frac{1}{n^2 + 33n + 252}; \\
29. & \sum_{n=1}^{\infty} \frac{1}{n^2 + 25n + 156}; \\
30. & \sum_{n=1}^{\infty} \frac{1}{n^2 + 27n + 182};
\end{aligned}$$

II. a) Berilgan sonli qatorlarning yaqinlashishining Dalamber yoki Koshi alomati bilan tekshiring (1-20).

$$\begin{aligned}
1. & \sum_{n=1}^{\infty} \left( \frac{3n+2}{3n} \right)^{n^2} & 2. & \sum_{n=1}^{\infty} \frac{1}{2^2} \left( 1 + \frac{1}{n} \right)^{n^2} & 3. & \sum_{n=1}^{\infty} \left( \frac{n}{n+1} \right)^{n^2} & 4. & \sum_{n=1}^{\infty} \frac{1}{3^n} \left( 1 + \frac{1}{n} \right)^{n^2} \\
5. & 1 + \frac{2}{3} + \frac{3}{9} + \frac{4}{27} + \dots & 6. & \frac{1}{2} + \frac{3}{2^2} + \frac{5}{2^3} + \frac{7}{2^4} + \dots & 7. & \frac{1}{2} + \frac{2}{5} + \frac{3}{8} + \frac{4}{11} + \dots \\
8. & \frac{3}{1} + \frac{9}{2} + \frac{27}{6} + \frac{81}{24} + \dots & 9. & \frac{2}{1} + \frac{3}{2} + \frac{4}{6} + \frac{5}{24} + \dots & 10. & \frac{1}{2} + \frac{2}{4} + \frac{6}{8} + \frac{24}{16} + \dots \\
11. & \sum_{n=1}^{\infty} \frac{1 \cdot 4 \cdot 7 \dots (3n-2)}{7 \cdot 9 \cdot 11 \dots (2n+5)} & 12. & \sum_{n=1}^{\infty} \frac{3^n}{n!} & 13. & \sum_{n=1}^{\infty} \frac{3n+2}{10^n} & 14. & \sum_{n=1}^{\infty} \frac{n!}{3^n} \\
15. & \sum_{n=1}^{\infty} \frac{2^n}{n^{10}} & 16. & \sum_{n=1}^{\infty} \frac{n}{3^n + 2} & 17. & \sum_{n=1}^{\infty} \left( \frac{10}{11} \right)^n \cdot n^5 & 18. & \sum_{n=1}^{\infty} \left( \frac{10}{11} \right)^5 \cdot \frac{1}{n^5} \\
19. & \sum_{n=1}^{\infty} \frac{2^n}{n!} & 20. & \sum_{n=1}^{\infty} \frac{n!}{5^n} & 21. & \sum_{n=1}^{\infty} \frac{n!}{n^n} & 22. & \sum_{n=1}^{\infty} \frac{n}{5^{n-1}} & 23. & \sum_{n=1}^{\infty} \frac{2n-1}{2^n} & 24. & \sum_{n=1}^{\infty} \frac{n^2}{n!} \\
25. & \sum_{n=1}^{\infty} \left( \frac{n+1}{n} \right)^n & 26. & \sum_{n=1}^{\infty} \left( \frac{n}{3n+1} \right)^n & 27. & \sum_{n=1}^{\infty} \left( \frac{2n+1}{2n} \right)^{n^2} & 28. & \sum_{n=1}^{\infty} \left( \frac{3n}{5n+1} \right)^n
\end{aligned}$$

$$29. \sum_{n=1}^{\infty} \left( \frac{n^2}{n^2+1} \right)^{n^2} \quad 30. \sum_{n=1}^{\infty} \left( \frac{6n+1}{n+1} \right)^n$$

III. Darajali qatorning yaqinlashish intervalini toping (1-30).

$$\begin{array}{lll}
 1. \sum_{n=1}^{\infty} \frac{nx^n}{(n+1)3^n} & 12. \sum_{n=1}^{\infty} \frac{3^n n!}{(n+1)^n} x^n & 23. \sum_{n=1}^{\infty} \frac{n^{\frac{n}{2}}}{(n+1)!} x^n \\
 2. \sum_{n=1}^{\infty} \frac{x^n}{2^n \sqrt{n}} & 13. \sum_{n=1}^{\infty} \frac{n^2}{n+1} x^n & 24. \sum_{n=1}^{\infty} \frac{x^n}{n(n+1)} \\
 3. \sum_{n=1}^{\infty} \frac{x^n}{(n+1)7^{n-1}} & 14. \sum_{n=1}^{\infty} \frac{x^n}{n^3} & 25. \sum_{n=1}^{\infty} \frac{2^n x^n}{\sqrt{(2n-1)3^n}} \\
 4. \sum_{n=1}^{\infty} \frac{x^n}{n!} & 15. \sum_{n=1}^{\infty} \frac{n^5 x^n}{(n+1)^n} & 26. \sum_{n=1}^{\infty} \frac{n^3}{n!} x^n \\
 5. \sum_{n=1}^{\infty} 5^n x^n & 16. \sum_{n=1}^{\infty} \frac{3^n x^n}{\sqrt[3]{n}} & 27. \sum_{n=1}^{\infty} \frac{x^n}{n} \\
 6. \sum_{n=1}^{\infty} \frac{4x^n}{2^n} & 17. \sum_{n=1}^{\infty} \frac{x^n}{3^n n!} & 28. \sum_{n=1}^{\infty} nx^n \\
 7. \sum_{n=1}^{\infty} \frac{3^n x^n}{n!} & 18. \sum_{n=1}^{\infty} \frac{(n+1)^2 x^n}{2^n} & 29. \sum_{n=1}^{\infty} \frac{x^n}{n^2} \\
 8. \sum_{n=1}^{\infty} \frac{2^n}{n(n+1)} x^n & 19. \sum_{n=1}^{\infty} \left( \frac{n}{n+1} \right)^n x^n & 30. \sum_{n=1}^{\infty} \frac{x^n}{(2n)!} \\
 9. \sum_{n=1}^{\infty} \frac{(n!)^2}{(2n)!} x^n & 20. \sum_{n=1}^{\infty} \frac{x^{2n-1}}{3n} & \\
 10. \sum_{n=1}^{\infty} \left( 1 + \frac{1}{n} \right)^2 x^n & 21. \sum_{n=1}^{\infty} \frac{(2n)! x^n}{n^n} & \\
 11. \sum_{n=1}^{\infty} \frac{x^{3n}}{8^n} & 22. \sum_{n=1}^{\infty} \frac{n! x^n}{(n+1)^n} & 
 \end{array}$$

## 4-HISOB-GRAFIK ISHI TOPSHIRIQLARI

I.  $x_1$  va  $x_2$  qiymatlarni qabul qilishi mumkin (bunda  $x_1 < x_2$ ) bo'lgan diskret tasodifiy miqdor  $x$  ning taqsimot qonunini toping.  $M(X)$  matematik kutilish,  $D(X)$  dispersiya va mumkin bo'lgan  $x_1$  qiymatining  $p_1$  ehtimoli ma'lum.

$$\begin{array}{lll}
 1. p_1 = 0,3, & M(X) = 2,7, & D(X) = 0,21. \\
 2. p_1 = 0,6, & M(X) = 2,4, & D(X) = 0,24. \\
 3. p_1 = 0,5, & M(X) = 2,5, & D(X) = 0,25. \\
 4. p_1 = 0,9, & M(X) = 2,1, & D(X) = 0,09. \\
 5. p_1 = 0,2, & M(X) = 3,6, & D(X) = 0,64.
 \end{array}$$

6.  $p_1 = 0,9$ ,  $M(X) = 3,1$ ,  $D(X) = 0,09$ .
7.  $p_1 = 0,8$ ,  $M(X) = 3,2$ ,  $D(X) = 0,16$ .
8.  $p_1 = 0,7$ ,  $M(X) = 3,3$ ,  $D(X) = 0,21$ .
9.  $p_1 = 0,6$ ,  $M(X) = 3,4$ ,  $D(X) = 0,24$ .
10.  $p_1 = 0,5$ ,  $M(X) = 3,5$ ,  $D(X) = 0,25$ .
11.  $p_1 = 0,4$ ,  $M(X) = 3,6$ ,  $D(X) = 0,24$ .
12.  $p_1 = 0,3$ ,  $M(X) = 3,7$ ,  $D(X) = 0,21$ .
13.  $p_1 = 0,2$ ,  $M(X) = 3,8$ ,  $D(X) = 0,16$ .
14.  $p_1 = 0,1$ ,  $M(X) = 3,9$ ,  $D(X) = 0,09$ .
15.  $p_1 = 0,9$ ,  $M(X) = 2,2$ ,  $D(X) = 0,36$ .
16.  $p_1 = 0,1$ ,  $M(X) = 1,9$ ,  $D(X) = 0,09$ .
17.  $p_1 = 0,3$ ,  $M(X) = 1,7$ ,  $D(X) = 0,21$ .
18.  $p_1 = 0,5$ ,  $M(X) = 1,5$ ,  $D(X) = 0,25$ .
19.  $p_1 = 0,7$ ,  $M(X) = 1,3$ ,  $D(X) = 0,21$ .
20.  $p_1 = 0,9$ ,  $M(X) = 1,1$ ,  $D(X) = 0,09$ .
21.  $p_1 = 0,2$ ,  $M(X) = 2,8$ ,  $D(X) = 0,16$ .
22.  $p_1 = 0,4$ ,  $M(X) = 2,6$ ,  $D(X) = 0,24$ .
23.  $p_1 = 0,7$ ,  $M(X) = 2,3$ ,  $D(X) = 0,21$ .
24.  $p_1 = 0,8$ ,  $M(X) = 2,2$ ,  $D(X) = 0,16$ .
25.  $p_1 = 0,1$ ,  $M(X) = 3,8$ ,  $D(X) = 0,36$ .
26.  $p_1 = 0,2$ ,  $M(X) = 1,8$ ,  $D(X) = 0,16$ .
27.  $p_1 = 0,4$ ,  $M(x) = 1,6$ ,  $D(x) = 0,24$
28.  $p_1 = 0,6$ ,  $M(X) = 1,4$ ,  $D(X) = 0,24$ .
29.  $p_1 = 0,8$ ,  $M(X) = 1,2$ ,  $D(X) = 0,16$ .
30.  $p_1 = 0,1$ ,  $M(X) = 2,9$ ,  $D(X) = 0,09$ .

**II.  $X$  tasodifiy miqdorning  $F(x)$  taqsimot funksiyasi berilgan bo`lsa, quyidagilarni aniqlang:**

- a)  $f(x)$  zichlik funksiya,
- b)  $M(x)$  matematik kutilma,
- v)  $D(x)$  dispersiya,
- g)  $\sigma(x)$  o`rta kvadratik chetlanish,
- d)  $P(0.3 < x < 0.7)$  extimollik.

$$1. F(x) = \begin{cases} 0, & \text{agap } x \leq 1 \text{ bo`lsa,} \\ \log_2 x, & \text{agap } 1 < x \leq 2, \text{ bo`lsa,} \\ 1, & \text{agap } x > 2 \text{ bo`lsa.} \end{cases}$$

$$2. F(x) = \begin{cases} 0, & \text{agap } x \leq 1 \text{ bo`lsa,} \\ \frac{1}{2} \ln x, & \text{agap } 1 < x \leq e^2, \text{ bo`lsa,} \\ 1, & \text{agap } x > e^2 \text{ bo`lsa.} \end{cases}$$

$$3. F(x) = \begin{cases} 0, & \text{агар } x \leq 0 \text{ бо`lsa,} \\ x^3, & \text{агар } 0 < x \leq 1 \text{ бо`lsa,} \\ 0, & \text{агар } x > 1 \text{ бо`lsa.} \end{cases}$$

$$4. F(x) = \begin{cases} 0, & \text{агар } x \leq 0 \text{ бо`lsa,} \\ 3x^2 + 2x, & \text{агар } 0 < x \leq \frac{1}{3} \text{ бо`lsa,} \\ 0, & \text{агар } x > \frac{1}{3} \text{ бо`lsa.} \end{cases}$$

$$5. F(x) = \begin{cases} 0, & \text{агар } x \leq 2 \text{ бо`lsa,} \\ \frac{1}{2}x - 1, & \text{агар } 2 < x \leq 4 \text{ бо`lsa,} \\ 1, & \text{агар } x > 4 \text{ бо`lsa.} \end{cases}$$

$$6. F(x) = \begin{cases} 0, & \text{агар } x \leq 0 \text{ бо`lsa,} \\ \frac{x^2}{9}, & \text{агар } 0 < x \leq 3 \text{ бо`lsa,} \\ 1, & \text{агар } x > 3 \text{ бо`lsa.} \end{cases}$$

$$7. F(x) = \begin{cases} 0, & \text{агар } x \leq 0 \text{ бо`lsa,} \\ \frac{x^2}{4}, & \text{агар } 0 < x \leq 2 \text{ бо`lsa,} \\ 1, & \text{агар } x > 2 \text{ бо`lsa.} \end{cases}$$

$$8. F(x) = \begin{cases} 0, & \text{агар } x \leq -\frac{\pi}{2} \text{ бо`lsa,} \\ \cos x, & \text{агар } -\frac{\pi}{2} < x \leq 0 \text{ бо`lsa,} \\ 1, & \text{агар } x > 0 \text{ бо`lsa.} \end{cases}$$

$$9. F(x) = \begin{cases} 0, & \text{агар } x \leq 0 \text{ бо`lsa,} \\ 2 \sin x, & \text{агар } 0 < x \leq \frac{\pi}{6} \text{ бо`lsa,} \\ 1, & \text{агар } x > \frac{\pi}{6} \text{ бо`lsa.} \end{cases}$$

$$10. F(x) = \begin{cases} 0, & \text{агар } x \leq \frac{3}{4}\pi \text{ бо`lsa,} \\ \cos 2x, & \text{агар } \frac{3}{4} < x \leq \pi, \text{ бо`lsa,} \\ 1, & \text{агар } x > \pi \text{ бо`lsa.} \end{cases}$$

$$11. F(x) = \begin{cases} 0, & \text{агар } x \leq 1 \text{ бо`lsa,} \\ \frac{x^2}{2} - \frac{x}{2}, & \text{агар } 1 < x \leq 2, \text{ бо`lsa,} \\ 1, & \text{агар } x > 2 \text{ бо`lsa.} \end{cases}$$

$$12. F(x) = \begin{cases} 0, & \text{агар } x \leq 0 \text{ бо`lsa,} \\ x^2, & \text{агар } 0 < x \leq 1, \text{ бо`lsa,} \\ 1, & \text{агар } x > 1 \text{ бо`lsa.} \end{cases}$$

$$13. F(x) = \begin{cases} 0, & \text{агар } x \leq 0 \text{ бо`lsa,} \\ \frac{x^3}{8}, & \text{агар } 0 < x \leq 2 \text{ бо`lsa,} \\ 1, & \text{агар } x > 2 \text{ бо`lsa,} \end{cases}$$

$$14. F(x) = \begin{cases} 0, & \text{агар } x \leq 0 \text{ бо`lsa,} \\ 2x^2 + x, & \text{агар } 0 < x \leq \frac{1}{2}, \text{ бо`lsa,} \\ 1, & \text{агар } x > \frac{1}{2} \text{ бо`lsa.} \end{cases}$$

$$15. F(x) = \begin{cases} 0, & \text{агар } x \leq 3, \text{ бо`lsa,} \\ \frac{1}{3}x - 1, & \text{агар } 3 < x \leq 6, \text{ бо`lsa,} \\ 1, & \text{агар } x > 6 \text{ бо`lsa.} \end{cases}$$

$$16. F(x) = \begin{cases} 0, & \text{агар } x \leq 0 \text{ бо`lsa,} \\ \frac{x^2}{25}, & \text{агар } 0 < x \leq 5 \text{ бо`lsa,} \\ 1, & \text{агар } x > 5 \text{ бо`lsa.} \end{cases}$$

$$17. F(x) = \begin{cases} 0, & \text{агар } x \leq 0 \text{ бо`lsa,} \\ \frac{4x^2}{9}, & \text{агар } 0 < x \leq \frac{3}{2}, \text{ бо`lsa,} \\ 1, & \text{агар } x > \frac{3}{2} \text{ бо`lsa.} \end{cases}$$

$$18. F(x) = \begin{cases} 0, & \text{агар } x \leq -\frac{\pi}{6} \text{ бо`lsa,} \\ \cos 3x, & \text{агар } -\frac{\pi}{6} < x \leq 0, \text{ бо`lsa,} \\ 1, & \text{агар } x > 0 \text{ бо`lsa.} \end{cases}$$

$$19. F(x) = \begin{cases} 0, & \text{агар } x \leq 0 \text{ бо`lsa,} \\ \sin x, & \text{агар } 0 < x \leq \frac{\pi}{2}, \text{ бо`lsa,} \\ 1, & \text{агар } x > \frac{\pi}{2} \text{ бо`lsa.} \end{cases}$$

$$20. F(x) = \begin{cases} 0, & \text{азар } x \leq 0 \text{ бо`lsa,} \\ \frac{8x^3}{27}, & \text{азар } 0 < x \leq \frac{3}{2}, \text{ бо`lsa,} \\ 1, & \text{азар } x > \frac{3}{2} \text{ бо`lsa.} \end{cases}$$

$$21. F(x) = \begin{cases} 0, & \text{азар } x \leq 0 \text{ бо`lsa,} \\ 4x^2 + 3x, & \text{азар } 0 < x \leq \frac{1}{4}, \text{ бо`lsa,} \\ 1, & \text{азар } x > 0 \text{ бо`lsa.} \end{cases}$$

$$22. F(x) = \begin{cases} 0, & \text{азар } x \leq 4 \text{ бо`lsa,} \\ \frac{1}{4}x - 1, & \text{азар } 4 < x \leq 8, \text{ бо`lsa,} \\ 1, & \text{азар } x > 8 \text{ бо`lsa.} \end{cases}$$

$$23. F(x) = \begin{cases} 0, & \text{азар } x \leq 0 \text{ бо`lsa,} \\ \frac{x^2}{36}, & \text{азар } 0 < x \leq 6, \text{ бо`lsa,} \\ 1, & \text{азар } x > 6 \text{ бо`lsa.} \end{cases}$$

$$24. F(x) = \begin{cases} 0, & \text{азар } x \leq 0 \text{ бо`lsa,} \\ 2\frac{1}{4}x^2, & \text{азар } 0 < x \leq \frac{2}{3}, \text{ бо`lsa,} \\ 1, & \text{азар } x > \frac{2}{3} \text{ бо`lsa.} \end{cases}$$

$$25. F(x) = \begin{cases} 0, & \text{азар } x \leq -\frac{\pi}{8} \text{ бо`lsa,} \\ \cos 4x, & \text{азар } -\frac{\pi}{8} < x \leq 0, \text{ бо`lsa,} \\ 1, & \text{азар } x > 0 \text{ бо`lsa.} \end{cases}$$

$$26. F(x) = \begin{cases} 0, & \text{азар } x \leq 0 \text{ бо`lsa,} \\ \sin 2x, & \text{азар } 0 < x \leq \frac{\pi}{4}, \text{ бо`lsa,} \\ 1, & \text{азар } x > \frac{\pi}{4} \text{ бо`lsa.} \end{cases}$$

$$27. F(x) = \begin{cases} 0, & \text{азар } x \leq 1 \text{ бо`lsa,} \\ \frac{x^2}{6} - \frac{x}{6}, & \text{азар } 1 < x \leq 3, \text{ бо`lsa,} \\ 1, & \text{азар } x > 3 \text{ бо`lsa.} \end{cases}$$

$$28. F(x) = \begin{cases} 0, & \text{азар } x \leq 1 \text{ бо`lsa,} \\ \ln x, & \text{азар } 1 < x \leq e, \text{ бо`lsa,} \\ 1, & \text{азар } x > e \text{ бо`lsa.} \end{cases}$$

$$29. F(x) = \begin{cases} 0, & \text{азар } x \leq 1 \text{ бо`lsa,} \\ \log_3 x, & \text{азар } 1 < x \leq 3, \text{ бо`lsa,} \\ 1, & \text{азар } x > 3 \text{ бо`lsa.} \end{cases}$$

$$30. F(x) = \begin{cases} 0, & \text{азар } x \leq 0 \text{ бо`lsa,} \\ \frac{x^2}{12} - \frac{x}{12}, & \text{азар } 1 < x \leq 4, \text{ бо`lsa,} \\ 1, & \text{азар } x > 4 \text{ бо`lsa.} \end{cases}$$

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