Mavzu:Bernulli tenglamasi. To’la differensial tenglama. Integrallovchi ko’paytuvchi.

Reja:

1. Bernulli tenglamasi.
2.To’la differensial tenglama.
3.Integrallovchi ko’paytuvchi.

Bernulli tenglamasi.

Bunday differensial tenglama

$$y' + P(x)y = y^n Q(x)$$

ko'rinishda bo'ladi. Bu tenglamada n =0 yoki n=1bo'lsa, chiziqli tenglama hosil bo'ladi. Demak $n \neq 0{,}1$ bo'lgan o'zgarmas. Bernulli tenglamasini y^n ga bo'lib,

$$\frac{y'}{y^n} + P(x)\frac{1}{y^{n-1}} = Q(x), \qquad \frac{1}{y^{n-1}} = z$$

$$z' = (y^{1-n})' = (1-n)y^{-n}y'$$

$$\frac{z'}{1-n} + P(x)z = Q(x) \quad yoki \quad z' + (1-n)P(x)z = (1-n)Q(x)$$

To’la differensial tenglama.

Bunday tenglama $du = M(x,y)dx + N(x,y)dy$

to’la differensialli tenglama deyiladi. $M(x,y)dx + N(x,y)dy = 0$

tenglama to’la differensialli tenglama bo’lishi uchun

$\frac{\partial M}{\partial y} = \frac{\partial N}{\partial x}$ shart bajarilishi kerak.

$u = \int M(x,y)dx + \varphi(y)$ $\frac{\partial u}{\partial y} = N(x,y)$

$\int \frac{\partial M}{\partial y} dx + \varphi'(y) = N(x,y)$ yoki $\varphi'(y) = N(x,y) - \int \frac{\partial M}{\partial y} dx$

$$\varphi(y) = \int \left(N(x,y) - \int \frac{\partial M}{\partial y} dx \right) dy + C$$

$$u(x,y) = \int M(x,y)dx + \int \left(N(x,y) - \int \frac{\partial M}{\partial y} dx \right) dy + C$$

Integrallovchi ko'paytuvchi.

$$M(x,y)dx + N(x,y)dy = 0$$

differensial tenglamaning o'ng tomoni biror funksiyaning to'la differensiali bo'lgan holni qaradik. Bu tenglamaning o'ng tomoni biror funksiyaning to'la differensiali bo'lmasin. Ayrim hollarda shunday $\mu(x,y)$ funksiyani tanlab olish mumkin buladiki, berilgan tenglamani shu funksiyaga ko'paytirilganda, uning chap tomoni biror funksiyaning to'la differensiali bo'lishi mumkin. Hosil qilingan differensial tenglamaning umumiy yechimi Bilan dastlabki berilgan tenglamaning umumiy echimi bir xil buladi. Bunday $\mu(x,y)$funksiyaga berilgan tenglamaning integrallavchi ko'paytuvchisi deyiladi. Integrallovchi ko'paytuvchini topish uchun , berilgan tenglamani hozircha noma'lum bo'lgan μ ga ko'paytirib, $\mu M(x,y)dx + \mu N(x,y)dy = 0$

$$\frac{\partial(\mu M)}{\partial y} = \frac{\partial(\mu N)}{\partial x} \qquad M\frac{\partial\mu}{\partial y} - N\frac{\partial\mu}{\partial x} = \mu\left(\frac{\partial N}{\partial x} - \frac{\partial M}{\partial y}\right) \qquad \frac{\partial \ln\mu}{\partial y} = \frac{\partial\mu}{\mu\,\partial y} \qquad M\frac{\partial \ln\mu}{\partial y} - N\frac{\partial \ln\mu}{\partial x} = \frac{\partial N}{\partial x} - \frac{\partial M}{\partial y}$$

$$N\frac{\partial \ln\mu}{\partial x} = \frac{\partial M}{\partial y} - \frac{\partial N}{\partial x} \qquad \frac{d\ln\mu}{dy} = \frac{\frac{\partial N}{\partial x} - \frac{\partial M}{\partial y}}{M} \qquad \mu = e^{\int\left(\frac{\partial M}{\partial y} - \frac{\partial N}{\partial x}\right)/N dx} \qquad \mu = e^{\int\left(\frac{\partial N}{\partial x} - \frac{\partial M}{\partial y}\right)/M dx}$$

Адабиётлар

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