1-amaliy mashg’ulot: Tekislikda berilgan egri chiziqlar asosida differensial tenglamalar tuzish

1. Egri chiziqdan differensial tenglama tuzish g‘oyasi

Berilgan egri chiziqlar oilasi:

$$F(x, y, c_1, c_2, ..., c_n) = 0$$

Differensial tenglama tuzish uchun

1. Parametirlarini $c_1, c_2, ..., c_n$ ni hosila orqali yuqotamiz,
2. oxirida parametrlar ishtirok etmaydigan n-tartibli differensial tenglama olinadi.

Agar oilada 1 ta konstanta bo‘lsa, u holda 1-tartibli differensial tenglama;
2 ta konstanta bo‘lsa, u holda 2-tartibli differensial tenglama va hokazo.

2. Quyidagi asosiy usullarni bajaramiz

1-usul. Egri chiziqni differensiallash

Berilgan:

$$y = f(x, c)$$

Hosila olamiz, so‘ng **c** ni yo‘qotamiz.

2-usul. Geometrik shartlar orqali

Masalan:

- yo‘nalish burchagi,
- normal yoki tangens sharti,
- radius-krivizna sharti va hokazo.

Mavzuga oid asosiy misollar

2-misol.

Egri chiziqlar oilasi:

$$y = Cx^2$$

Differensial tenglamani tuzing.

Yechish:

1. hosila olinadi:
   $$y' = 2Cx$$
2. $C = \frac{y}{x^2}$ yoki hosiladan $C = \frac{y'}{2x}$
3. Topilgan C larni tenglashtiramiz
   $$\frac{y}{x^2} = \frac{y'}{2x}$$
   $$2y = xy'$$
   Bu birinchi tartibli differensial tenglamadir.

2-misol. Egri chiziqlar oilasi:

$$y = Ce^{kx}$$

Differensial tenglamani tuzing.

Yechish:

$$y' = kCe^{kx} = kx$$
$$y' - kx = 0$$

3-misol. Ikki konstantali egri chiziqlar oilasi

$$y = C_1e^{kx} + C_2e^{-x}$$

Differensial tenglamani tuzing.

Yechish:

$$y' = C_1e^{kx} - C_2e^{-x}$$
$$y'' = C_1e^{kx} + C_2e^{-x} = y$$

Demak:

$$y'' - y = 0$$

2 ta konstanta bo'lsa, u holda 2-tartibli differensial tenglama hosil bo‘ladi.

AMALIY TOPSHIRIQLAR

1-topshiriq

Berilgan egri chiziqlar oilasidan differensial tenglamani tuzing:

$$y = \frac{C}{x}$$

2-topshiriq

Egri chiziqlar:

$$y = C_1 x + C_2$$

2-tartibli differensial tenglamani tuzing.

3-topshiriq

$$y^2 + x^2 = 2Cx$$

Differensial tenglamani tuzing.

4-topshiriq

$$y = Ce^{-x} + C$$

Differensial tenglamani tuzing.

5-topshiriq

Quyidagi geometrik shart asosida differensial tenglama tuzing:

“Egri chiziqning normal chizig‘i koordinata boshidan o‘tadi.”

Normal tenglamasi:

$$y' = -\frac{x}{y}$$

Differensial tenglamani tuzing.

MUSTAQIL ISH TOPSHIRIQLARI

1. Berilgan:

   $$xy' = y + Cx$$

Oilaga mos keluvchi differensial tenglamani tuzing.

2. Egri chiziqlar:
   $y = C\sin x$
   Differensial tenglamani tuzing.
3. Parabola oilasi:
   $y = ax^2 + bx + c$

Differensial tenglamani tuzing.

TEST TOPSHIRIQLARI (Javoblari bilan)

1. Berilgan $y = Ce^{2x}$ differensial tenglamani toping:

   A) $y' = y$

   B) $y' = 2y$

   C) $y'' = 4y$

   D) $y' = 0$

   Javob: B

   2. Egri chiziqlar oilasi y=Cx differensial tenglamani toping: