

717 (178)
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Q, 5) $\frac{dy}{dt} = \frac{1}{3y+2}$ $y \neq -\frac{2}{3}$

5) $\frac{dy}{dt} = \frac{1}{3y+2} \quad (y \neq -\frac{2}{3})$

$\Rightarrow (3y+2)dy = dt \Rightarrow \int (3y+2)dy = \int dt \Rightarrow \frac{3y^2}{2} + 2y = t + C$

$\Rightarrow 3y^2 + 4y - 2(t+C) = 0 \Rightarrow y_{1,2} = \frac{-4 \pm \sqrt{16 + 24(t+C)}}{6} = \frac{-4 \pm 2\sqrt{4 + 6(t+C)}}{6} = \frac{-2 \pm \sqrt{4 + 6(t+C)}}{3}$

לפי תנאי התחלה $y(0) = 1$ נבחר את הפתרון $y = \frac{-2 + \sqrt{4 + 6(t+C)}}{3}$

6) 2. $\frac{dy}{dt} = y(1-y), \quad y(1) = 1$

יש נקודות קריטיות ב $y=0$ ו $y=1$

$y(1-y)=0 \Rightarrow y=0$ או $y=1$

אם $y=0$ אז $\frac{dy}{dt} = 0$ ו $y=1$ אז $\frac{dy}{dt} = 0$

אם $y=1$ אז $\frac{dy}{dt} = 0$

$\frac{dy}{y(1-y)} = dt \Rightarrow (\frac{A}{y} + \frac{B}{1-y}) dy = dt \Rightarrow A(1-y) + By = 1 \Rightarrow A - Ay + By = 1 \Rightarrow A - A + B = 1 \Rightarrow B = 1$

$\Rightarrow (\frac{1}{y} - \frac{1}{1-y}) dy = dt \Rightarrow \ln|y| - \ln|1-y| = t + C \Rightarrow \ln|\frac{y}{1-y}| = t + C$

$\Rightarrow \frac{y}{1-y} = e^{t+C} = e^t \cdot e^C = k \cdot e^t \Rightarrow \frac{y}{1-y} = k \cdot e^t$

3. $\frac{dy}{dt} = y(1-y), \quad y(2) = 2$

יש נקודות קריטיות ב $y=0$ ו $y=1$

$\ln|y| - \ln|1-y| = t + C \Rightarrow \ln|\frac{y}{1-y}| = t + C \Rightarrow [\frac{y}{1-y} = k \cdot e^t]$

$y(2)=2$ נמצא את k

$\frac{2}{1-2} = k \cdot e^2 \Rightarrow k = -\frac{2}{e^2} \Rightarrow \frac{y}{1-y} = -\frac{2}{e^2} \cdot e^t \Rightarrow y = (y-1)2e^{t-2} \Rightarrow y = 2e^{t-2} - 2e^{t-2}$

$y(2e^{t-2} - 1) = 2e^{t-2} \Rightarrow$

$y(t) = \frac{2e^{t-2}}{2e^{t-2} - 1}$

$t \neq 2 - \ln 2$

$2e^{t-2} \neq 1 \Rightarrow e^{t-2} \neq \frac{1}{2} \Rightarrow t-2 \neq \ln(\frac{1}{2})$

2, 7

צ"ב שלום / מרבותי קמ"ח
גמול / 3

$y = \frac{x^2}{2} - x + 1$

$$d' = \frac{2^y}{x} \sqrt{1 + x^2} + \frac{2}{x} \sqrt{1 + (1-y)x^2}$$

$$y' + \frac{2}{x}y = x - 2 + \frac{2}{x}$$

$$\mu'(x) = \frac{2}{x} \mu(x)$$

1. $\mu(x)$ 0011

$$\Rightarrow \frac{\mu'}{\mu} = \frac{2}{x} \Rightarrow \ln|\mu| = 2 \ln|x| + C$$

1) $\langle 110 | \hat{H} | 110 \rangle = \mu = x^2$ para $n=1$

$$x^2 y' + 2xy = x^3 - 2x^2 - 2x$$

$$\Rightarrow \int x^2 y = \int (x^3 - 2x^2 + 2x) dx \Rightarrow x^2 y = \frac{x^4}{4} - \frac{2}{3}x^3 + x^2 + C$$

$$\Rightarrow y = \frac{x^2}{4} - \frac{2}{3}x + 1 + \frac{C}{x^2} \quad | C \in \mathbb{R}$$

⑧ 1. $\frac{dy}{dx} - y = 3e^x / (e^x)$

$(\mu(x) = e^x : 23/07/19, 1/1/20 \text{ also } 5/8)$

$$e^{-x}y' - e^{-x}y = 3 \Rightarrow e^{-x}y = \int 3 dx \Rightarrow e^{-x}y = 3x + C$$

$$\Rightarrow y = (3x+1)e^x$$

$$e^0 \cdot 1 = 3 - 0 + c \Rightarrow c = 1 \quad \uparrow \quad \text{für } y(0) = 1$$

2. $xy' + y = \cos x, x > 0$

$(\mu(x) = x, \text{ } \tau_B(x) = x)$

$$\Rightarrow xy = \int \cos x \, dx \Rightarrow xy = \sin x + C$$

$C_2 \uparrow$

$$\Leftrightarrow \frac{1}{2} \cdot \frac{y}{x} = \sin \frac{\pi}{2} + C : \left(y \left(\frac{x}{2} \right) = \frac{y}{x} \right) \text{ (un) } \sin$$

$$\Rightarrow y = \frac{\sin x - 1}{x}$$