Доманєв Сергій

3) $\begin{cases} yy''-y'^2=(y'-y)^2 \\ y(0)=1 \\ y'(1)=0 \\ y(x)\neq 0 \end{cases}$, $\boxed{\begin{matrix} y(0)=1, \\ y'(1)=0, \\ y(x)\neq 0 \end{matrix}}$

$yy''-y'^2=(y'-y)^2=\Big|$ [redacted] ,

$u=\dfrac{y'}{y}$ $\quad y'=uy \quad y''=u'$ [redacted] $y + u^2$

$3y(u'y+u^2y)-2(uy)^2-y^2=0$

$3u'y^2+3u^2y^2-2u^2y^2-y^2=0 \quad /$ [redacted] y^2

$3u'+u^2-1=0$

$3u'=1-u^2$

$\dfrac{3du}{1-u^2}=dx$

$3\,\mathrm{arctg}\, u=x+C_1=\Big|\, u=\dfrac{y'}{y}\,\Big| \Rightarrow$

$\Rightarrow 3\,\mathrm{arctg}\,\dfrac{y'}{y}=x+C_1$

$$\frac{y'}{y} = tg\,\frac{x + C_1}{3} = tg\left(\frac{x}{3} + C_1\right)$$

$$\ln y = -3\ln\left(\cos\left(C_1 + \frac{x}{3}\right)\right) + C_2$$

$$y = \frac{C_2}{\cos^3\left(C_1 + \frac{x}{3}\right)}$$

$$y' = C_2\, tg\left(C_1 + \frac{x}{3}\right) + \sec^3\left(C_1 + \frac{x}{3}\right)$$

$$\begin{cases} 1 = \dfrac{C_2}{\cos^3(C_1 + 0)} = \dfrac{C_2}{\cos^3 C_1} \\ 0 = C_2\,\dfrac{\sin\left(C_1 + \frac{1}{3}\right)}{\cos^4\left(C_1 + \frac{1}{3}\right)} \\ 0 \neq \dfrac{C_2}{\cos^3\left(C_1 + \frac{x}{3}\right)} \end{cases}$$

$C_2 \neq 0 \qquad \sin\left(C_1 + \frac{1}{3}\right) = 0 \qquad C_1 = -\frac{1}{3}$

$C_2 = \cos^3 \frac{1}{3}$

$x \neq \frac{3\pi}{2} + \frac{1}{3} + 3\pi n, n \in Z$

Ответ: $y = \dfrac{\cos^3 \frac{1}{3}}{\cos^3\left(-\frac{1}{3} + \frac{x}{3}\right)}$,

$x \neq \frac{3\pi}{2} + \frac{1}{3} + 3\pi n, n \in Z$

2) $r'' + 8r' + 16r = -45e^{-\Theta}$

$\lambda^2 + 8\lambda + 16 = 0$

$\lambda_{1,2} = -4$

$r = C_1 e^{-4\Theta} + C_2 e^{-4\Theta}\Theta$

$r_{oz} = Ae^{-\Theta}$

$r_{oz} = -5e^{-\Theta}$

$r_{on} = C_1 e^{-4\Theta} + C_2 \Theta e^{-4\Theta} - 5e^{-\Theta}$

$-5e^3 + 16e^{12} = C_1 e^{12} - 3C_2 e^{12} - 5e^3$

$$\begin{cases} -1 = C_1 - 5 \\ 16 = C_1 - 3C_2 \end{cases} \Rightarrow C_2$$

$C_2 = -4 \quad C_1 = 4$

Ответ: $r = 4e^{-4\Theta} - 4\Theta e^{-4\Theta} - 5e^{-\Theta}$

1) $$\begin{cases} r'' + 4r' + 3r = (48\Theta + 158)e^{5\Theta} \\ r'(0) = 8 \\ r'(4) = \dfrac{-9 + e^8 + 36e^{32}}{e^{12}} \end{cases}$$

$P = 3\Theta$

$\tilde{f} = f \cdot P = (48\Theta + 158)e^{8\Theta}$

$u'' + 4u' + 3u = 0$

$\lambda^2 + 4\lambda + 3 = 0$

$D = 4$

$\lambda_{1,2} = -3, -1$

$u = C_1 e^{-3} + C_2 e^{-1}$

$v' = Ax^2 + bx + Ce$

$-9e^{-12} + e^{-4} + 36e^{20} = Ax^2 + bx + 8$

$v = \frac{A}{3}x^3 + \frac{b}{2}x^2 - 8e^{-x}$

$$\frac{-9 + e^{x} + e^{9x}}{e^{3x}}$$

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