$$3m^2 + 12m + c = 0$$

$$\Delta = 144 - 12c > 0$$

$$c < 12$$

$$\boxed{y(x) = Ae^{r_1 x} + Be^{r_2 x}}$$

$$\Delta = 0$$
$$c = 12$$

$$y(x) = (A + Bx)e^{-2x}$$

$$W = \begin{bmatrix} e^{-2x} & xe^{-2x} \\ -2e^{-2x} & -2xe^{-2x} + e^{-2x} \end{bmatrix}$$

$$|W| = e^{-2x}(-2xe^{-2x} + e^{-2x}) - xe^{-2x}(-2e^{-2x})$$

$$= \boxed{e^{-4x} \neq 0} \quad \text{linearly independent}$$

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$\Delta < 0$

$c > 12$

$$y(x) = e^{-2x}\left(\left(A\cos\sqrt{c-12}\ x\right) + \left(B\sin\sqrt{c-12}\ x\right)\right)$$

possible smallest $c = 13$

$$3r^2 + 12r + 13 = 0$$

$$r_{12} = -2 \mp \frac{\sqrt{3}}{3}i$$

$$y(x) = Ae^{-2x}\cos\left(\frac{\sqrt{3}}{3}x\right) + Be^{-2x}\sin\left(\frac{\sqrt{3}}{3}x\right)$$

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