$$y'' - y' - 2y = 0$$

$$y'' + 25y = 0$$

$$y'' - y' = 0$$

$$y'' - 4y' + 4y = 0$$

$$y'' - 7y' + 6y = 0$$

$$y'' + y' - 2y = 0$$

$$y'' + y = 0$$

$$y'' - 2y' - y = 0$$

$$4\frac{\mathrm{d}^2 x}{\mathrm{d}t^2} - 20\frac{dx}{dt} + 25x = 0$$

$$y'' - 4y' + 13y = 0$$

$$y'' - 10y' + 25y = 0,\ y(0) = 0,\ y'(0) = 1$$

$$y'' - 2y' + 10y = 0,\ y(\tfrac{\pi}{6}) = 0,\ y'(\tfrac{\pi}{6}) = 2$$

$$y'' + 3y' = 0,\ y(0) = 1,\ y'(0) = 2$$

$$y'' + 4y' = 0,\ y(0) = 1,\ y'(0) = 2$$

$$y'' - 12y = 0,\ y(\tfrac{1}{\sqrt{3}}) = \tfrac{4}{e^2},\ y(0) = 4$$

$$9\frac{\mathrm{d}^2 y}{\mathrm{d}x^2} + 16y = 0,\ y(0) = -9,\ y'(0) = 12\tfrac{1}{2}$$

$$y'' - 7y' + 6y = \sin x$$

$$y'' + 2y' + 5y = -\tfrac{17}{2}\cos 2x$$

$$2y'' + y' - y = 2e^x$$

$$y'' + a^2 y = e^x$$

$$y'' - 6y' + 9y = 2x^2 - x + 3$$

$$y'' + 4y' - 5y = 1$$
$$y'' - 4y' + 4y = f(x)$$

$$f(x) = e^{-x}$$

$$f(x) = 3e^{2x}$$

$$f(x) = 2(\sin 2x + x)$$

$$f(x) = 8(x^2 + e^{2x} + \sin 2x)$$

$$\boxed{C_1 e^{2x} + C_2 e^{-x}}$$

$$\boxed{C_1 \cos 5x + C_2 \sin 5x}$$

$$\boxed{C_1 + C_2 e^x}$$

$$\boxed{C_1 e^{2x} + C_2 x e^{2x}}$$

$$\boxed{C_1 e^x + C_2 e^{6x}}$$

$$\boxed{C_1 e^x + C_2 e^{-2x}}$$

$$\boxed{C_1 \cos x + C_2 \sin x}$$

$$\boxed{C_1 e^{(1+\sqrt{2})x} + C_2 e^{(1-\sqrt{2})x}}$$

$$\boxed{x(t) = C_1 e^{\frac{2}{5}t} + C_2 t e^{\frac{2}{5}t}}$$

$$\boxed{e^{2x}(C_1 \cos 3x + C_2 \sin 3x)}$$

$$\boxed{x e^{5x}}$$

$$\boxed{-\tfrac{2}{3} e^{-\frac{\pi}{6}} e^x \cos 3x}$$

$$\boxed{\tfrac{8}{3} - \tfrac{2}{3} e^{-3x}}$$

$$\boxed{\tfrac{3}{2} - \tfrac{1}{2} e^{-4x}}$$

$$\boxed{4 e^{-2\sqrt{3}x}}$$

$$\boxed{-9\cos\tfrac{4}{3}x + \tfrac{75}{8}\sin\tfrac{4}{3}x}$$

$$\boxed{Y = \tfrac{7}{74}\cos x + \tfrac{5}{74}\sin x + C_1 e^x + C_2 e^{6x}}$$

$$\boxed{Y = -\tfrac{1}{2}\cos 2x + 2\sin 2x + e^{-x}(C_1 \cos 2x + C_2 \sin 2x)}$$

$$\boxed{Y = e^x + C_1 e^{-x} + C_2 e^{\frac{1}{2}x}}$$

$$\boxed{Y = \tfrac{1}{1+a^2} e^x + C_1 \cos ax + C_2 \sin ax}$$

$$\boxed{Y = \tfrac{1}{27}(6x^2 + 5x + 11) + C_1 e^{3x} + C_2 x e^{3x}}$$

$$\boxed{Y = -\tfrac{1}{5} + C_1 e^x + C_2 e^{-5x}}$$

$$\boxed{Y = \tfrac{1}{9} e^{-x} + C_1 e^{2x} + C_2 x e^{2x}}$$

$$\boxed{Y = (\tfrac{3}{2}x^2 + C_2 x + C_1)e^{2x}}$$

$$\boxed{Y = \tfrac{1}{2}\cos 2x + \tfrac{1}{2}(x+1) + C_1 e^{2x} + C_2 x e^{2x}}$$

$$\boxed{Y = 2x^2 + 4x + 3 + 4x^2 e^{2x} + \cos 2x + C_1 e^{2x} + C_2 x e^{2x}}$$

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$y'' + y = f(x)$
$f(x) = 2x^3 - x + 2$

$f(x) = -8\cos 3x$

$f(x) = \cos x$

$f(x) = \sin x - 2e^{-x}$

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

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

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

$y^{IV} - 2y''' + y'' = 0$

$y^{IV} + a^4 y = 0$

$y''' - 2y'' + y' = 0$

$y''' = \frac{1}{x}$

$y''' = \cos 2x$

$$\boxed{Y = y_p + y_v = 2x^3 - 13x + 2 + C_1\cos x + C_2\sin x}$$

$$\boxed{Y = \cos 3x + C_1\cos x + C_2\sin x}$$

$$\boxed{Y = \tfrac{1}{2}x\sin x + C_1\cos x + C_2\sin x}$$

$$\boxed{Y = -\tfrac{1}{2}x\cos x - e^{-x} + C_1\cos x + C_2\sin x}$$

$$\boxed{\ln|e^x - 1|(e^x - e^{-x}) - xe^x - 1 + C_1 e^x + C_2 e^{-x}}$$

$$\boxed{-xe^x + xe^x\ln|x| + C_1 e^x + C_2 xe^x}$$

$$\boxed{\tfrac{3x^2}{2}e^{-x} - 2x + 1 + C_1 e^{-x} + C_2 xe^{-x}}$$

$$\boxed{Ae^x + Bxe^x + Cx + D}$$

$$\boxed{e^{\frac{\sqrt{2}}{2}a}\left(C_1\cos\left(\tfrac{\sqrt{2}}{2}ax\right) + C_2\sin\left(\tfrac{\sqrt{2}}{2}ax\right)\right) + e^{-\frac{\sqrt{2}}{2}a}\left(C_3\cos\left(\tfrac{\sqrt{2}}{2}ax\right) + C_4\sin\left(\tfrac{\sqrt{2}}{2}ax\right)\right)}$$

$$\boxed{Cxe^x + De^x + E}$$

$$\boxed{\tfrac{1}{2}x^2\ln x + Cx^2 + Dx + E}$$

$$\boxed{-\tfrac{\sin 2x}{8} + Cx^2 + Dx + E}$$