Worked example

Find general solutions to:

$$\frac{dy}{dx} + 2y = e^x$$

$$\frac{dy}{dx} - y = e^{2x}$$

Your turn

Find the general solution to:

$$\frac{dy}{dx} - 4y = e^x$$

$$y = -\frac{1}{3}e^x + ce^{4x}$$

Worked example

Find general solutions to:

$$\cos x \frac{dy}{dx} + y \sin x = 1$$

Your turn

Find the general solution to:

$$\cos x \frac{dy}{dx} + 2y \sin x = \cos^4 x$$

$$y = \cos^2 x \, (\sin x + c)$$

Worked example

Find the particular solution such that $y = 3$ when $x = \pi$:

$$\cos x \frac{dy}{dx} + y \sin x = 1$$

Your turn

Find the particular solution such that $y = 2$ when $x = 0$:

$$\cos x \frac{dy}{dx} + 2y \sin x = \cos^4 x$$

$$y = \cos^2 x \, (\sin x + 2)$$

Worked example

Find the particular solution such that $y = 2$ when $x = 0$:

$$\cos x \frac{dy}{dx} - y = 1, -\frac{\pi}{2} < x < \frac{\pi}{2}$$

Your turn

Find the particular solution such that $y = 2$ when $x = 0$:

$$\cos x \frac{dy}{dx} + y = 1, -\frac{\pi}{2} < x < \frac{\pi}{2}$$

$$y = 1 + \frac{\cos x}{1 + \sin x}$$

Worked example

Find general solutions to:

$$x\frac{dy}{dx} + 3y = \frac{\ln x}{x}, \qquad x > 0$$

Your turn

Find the general solution to:

$$x\frac{dy}{dx} + 5y = \frac{\ln x}{x}, \qquad x > 0$$

$$y = \frac{\ln x}{4x} - \frac{1}{16x} + \frac{c}{x^5}$$

Worked example

Solve the differential equation, giving y in terms of x, where

$$x^4 \frac{dy}{dx} - x^3 y = 1$$

and $y = 1$ at $x = 1$

Your turn

Solve the differential equation, giving y in terms of x, where

$$x^3 \frac{dy}{dx} - x^2 y = 1$$

and $y = 1$ at $x = 1$

$$y = -\frac{1}{3x^2} + \frac{4x}{3}$$