11.10) Solving differential equations

Worked example

Find the general solution to:

$$\frac{dy}{dx} = xy - y$$

Your turn

Find the general solution to:

$$\frac{dy}{dx} = xy + y$$

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

Worked example

Find the general solution to:

$$(1-x^2)\frac{dy}{dx} = x\cot y$$

Your turn

Find the general solution to:

$$(1+x^2)\frac{dy}{dx} = x\tan y$$

$$y = \arcsin\left(k\sqrt{1+x^2}\right)$$

Worked example

Find the particular solution to:

$$\frac{dy}{dx} = -\frac{3(y+2)}{(2x-1)(x-2)}$$

given that $x = 4$ when $y = 5$

Your turn

Find the particular solution to:

$$\frac{dy}{dx} = -\frac{3(y-2)}{(2x+1)(x+2)}$$

given that $x = 1$ when $y = 4$

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

Worked example

Find the particular solution to:

$$\frac{dy}{dx} = -\frac{5}{y\sin^2 x}$$

given that $y = 4$ at $x = \frac{\pi}{4}$

Your turn

Find the particular solution to:

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

given that $y = 2$ at $x = \frac{\pi}{4}$

$$y^2 = -6\tan x + 10$$

Worked example

Find the particular solution to:

$$\frac{dy}{dx} = xy\cos x$$

given that $y = 1$ at $x = \frac{\pi}{2}$

Your turn

Find the particular solution to:

$$\frac{dy}{dx} = xy\sin x$$

given that $y = 1$ at $x = \frac{\pi}{2}$

$$\ln|y| = \sin x - x\cos x - 1$$