

Key

1. Find the antiderivatives of the following functions:

$$\text{a) } f(x) = \frac{x^2}{-3} + \frac{2}{3\sqrt[3]{x}} = -\frac{1}{3}x^2 + \frac{2}{3}x^{-\frac{1}{3}}$$

$$\begin{aligned} \int f(x) dx &= -\frac{1}{3} \int x^2 dx + \frac{2}{3} \int x^{-\frac{1}{3}} dx = -\frac{1}{3} \frac{x^3}{3} + \frac{2}{3} \frac{x^{-\frac{1}{3}+1}}{\frac{2}{3}} + C \\ &= -\frac{x^3}{9} + x^{-\frac{2}{3}} \end{aligned}$$

$$\text{b) } f(x) = 3e^{2x} + \frac{1}{x}$$

$$\int 3e^{2x} + \frac{1}{x} dx = \frac{3e^{2x}}{2} + \ln x + C$$

$$\text{c) } f(x) = 2\cos x - \sin x$$

$$\begin{aligned} \int 2\cos x - \sin x dx &= 2\sin x - (-\cos x) + C \\ &= 2\sin x + \cos x + C \end{aligned}$$

$$\text{Bonus: } f(x) = \frac{x^2 + x - 2}{x} = \frac{x^2}{x} + \frac{x}{x} - \frac{2}{x} = x + 1 - \frac{2}{x}$$

$$\int f(x) = x^2 + x - 2 \ln x + C$$