

Question 1 (8 marks)

For the functions below, determine $\frac{dy}{dx}$. You do not need to simplify your answers.

(a) $y = 5 + 4\sqrt{x} - \frac{10}{x^3}$.

$$y = 5 + 4x^{1/2} - 10x^{-3}$$
$$\frac{dy}{dx} = 2x^{-1/2} + 30x^{-4}$$

(2 marks)

(b) $y = \frac{e^{0.5x}}{0.7x + e^x}$.

$$\frac{dy}{dx} = \frac{0.5e^{0.5x} \cdot (0.7x + e^x) - e^{0.5x} \cdot (0.7 + e^x)}{(0.7x + e^x)^2}$$

(3 marks)

(c) $y = \ln(x^2\sqrt{1-4x})$.

$$y = \ln[x^2(1-4x)^{1/2}]$$
$$= \ln x^2 + \ln(1-4x)^{1/2}$$
$$= 2 \ln x + \frac{1}{2} \ln(1-4x)$$
$$\frac{dy}{dx} = 2 \cdot \frac{1}{x} + \frac{1}{2} \cdot \frac{-4}{1-4x}$$

(3 marks)