

Question 1 (11 marks)

(a) Using first principles, find $f'(x)$ if $f(x) = x^2 - 3$.

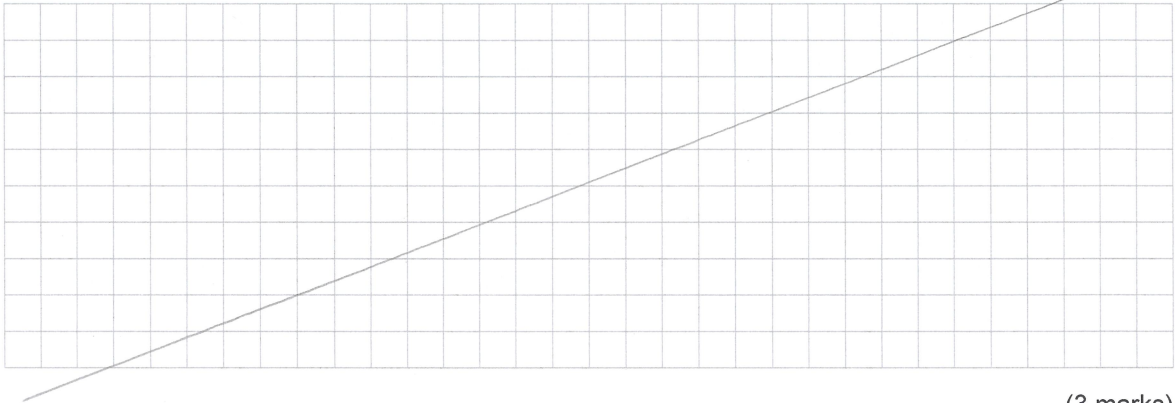
(3 marks)

(b) Determine $\frac{dy}{dx}$ for the following two functions. You do not need to simplify your answers.

(i) $y = 3x^4 + (7 + \sin x)^2$

(3 marks)

(ii) $y = \frac{\ln(x^5 + 1)}{e^x}$



(3 marks)

(c) Determine $\int \left(\frac{1}{x-3} + 4 \right) dx$, where $x > 3$.

$$\int \frac{1}{x-3} + 4 dx = \ln(x-3) + 4x + c$$

(2 marks)