Question 1 (11 marks)

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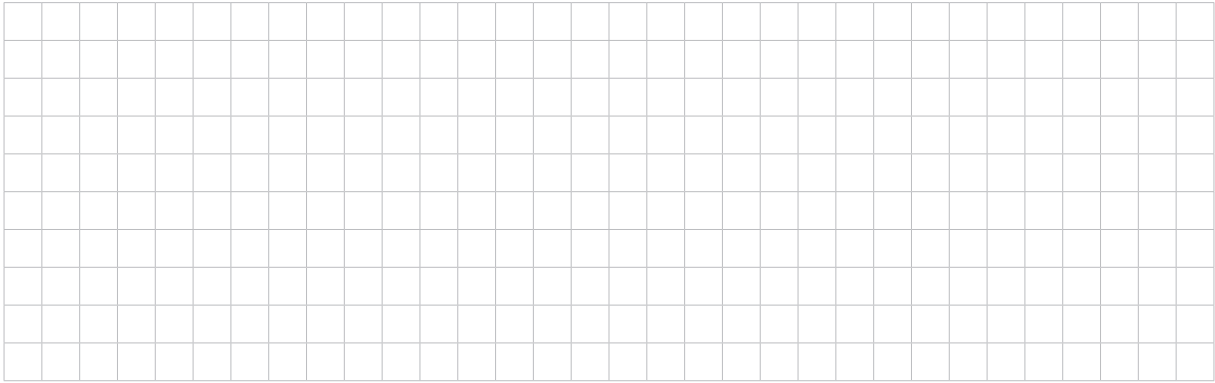
(3 marks)

(b) Determine $\dfrac{dy}{dx}$ for the following two functions. You do not need to simplify your answers.
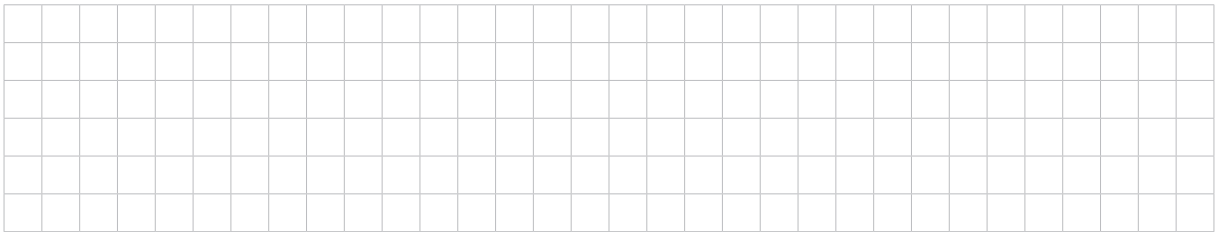
(i) $y = 3x^4 + (7 + \sin x)^2$

(3 marks)

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

(3 marks)

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

(2 marks)

PLEASE TURN OVER