Question 7 (9 marks)
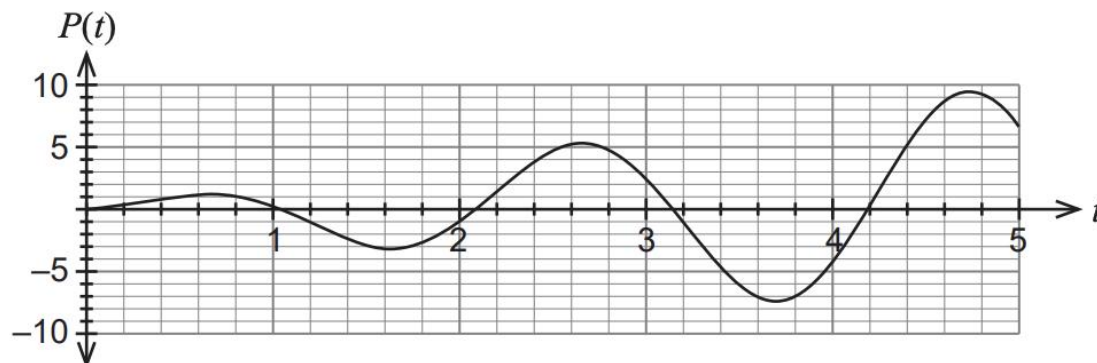
A company's profit, in millions of dollars, over a five-year period can be modelled by the function:

$$P(t) = 2t \sin(3t) \quad 0 \le t \le 5 \text{ where } t \text{ is measured in years.}$$

The graph of $P(t)$ is shown below.

(a) Differentiate $P(t)$ to determine the marginal profit function, $P'(t)$. (2 marks)

(b) Calculate the rate of change of the marginal profit function when $t = \dfrac{\pi}{18}$ years. (4 marks)

(c) Use the increments formula at $t = \dfrac{7\pi}{6}$ to estimate the change in profit for a one month change in time. (3 marks)