

5.

$$f(x) = x^3 + ax^2 - ax + 48, \text{ where } a \text{ is a constant.}$$

Given that $f(-6) = 0$,

(a) (i) show that $a = 4$.

(ii) express $f(x)$ as a product of two algebraic factors.

(4)

Given that $2 \log_2(x + 2) + \log_2 x - \log_2(x - 6) = 3$,

(b) show that $x^3 + 4x^2 - 4x + 48 = 0$.

(4)

(c) Hence explain why $2 \log_2(x + 2) + \log_2 x - \log_2(x - 6) = 3$ has no real roots.

(2)**(Total for Question 5 is 10 marks)**