

3. Given that

$$\log_2(x+3) + \log_2(x+10) = 2 + 2\log_2 x$$

(a) show that

$$3x^2 - 13x - 30 = 0$$

(3)

(b) (i) Write down the roots of the equation

$$3x^2 - 13x - 30 = 0$$

(ii) Hence state which of the roots in part (b)(i) is not a solution of

$$\log_2(x+3) + \log_2(x+10) = 2 + 2\log_2 x$$

giving a reason for your answer.

(2)

(a) $2 = \log_2 4$ because $2^2 = 4$ so,

$$\log_2(x+3) + \log_2(x+10) = \log_2 4 + 2\log_2 x$$

$$\log_2(x+3) + \log_2(x+10) = \log_2 4 + \log_2 x^2$$

$$\log_2((x+3)(x+10)) = \log_2(4x^2)$$

$$(x+3)(x+10) = 4x^2$$

$$x^2 + 13x + 30 = 4x^2$$

$$3x^2 - 13x - 30 = 0$$

(b) (i) $(x-6)(3x+5) = 0 \Rightarrow x = -\frac{5}{3}, 6$

(ii) the \log of a negative number is undefined,
so $\log_2(-\frac{5}{3})$ in the original equation is undefined,

so $x = 6$ only