

QUESTION 1

1.1 Solve, for $x \in \mathbb{R}$:

(a) $2e^x - 7 + 6e^{-x} = 0$, expressing your answers in exact form using logs

$$\begin{aligned} \therefore 2e^{2x} - 7e^x + 6 &= 0 \\ \therefore (2e^x - 3)(e^x - 2) &= 0 \\ \therefore e^x &= \frac{3}{2} \text{ or } e^x = 2 \\ \therefore x &= \ln \frac{3}{2} \text{ or } x = \ln 2 \end{aligned}$$

(b) $|2x + 3| = 5x - 2$

$$\begin{aligned} |2x + 3| &= 5x - 2 \\ 2x + 3 &= 5x - 2 \text{ or } 2x + 3 = -(5x - 2) \\ \therefore 5 &= 3x \text{ or } 7x = -1 \\ \therefore x &= \frac{5}{3} \text{ or } x = -\frac{1}{7} \end{aligned}$$

a check reveals that $x = \frac{5}{3}$ only

(c) Solve $\frac{(-x^2 - 5)(x^2 - 16)}{|x + 3|(x + 2)} \geq 0$

$$\begin{aligned} \frac{(-x^2 - 5)(x^2 - 16)}{|x + 3|(x + 2)} &\geq 0 \\ \therefore \frac{(-x^2 - 5)(x^2 - 16)}{(x + 2)} &\geq 0 \\ \therefore \frac{(x^2 - 16)}{(x + 2)} &\leq 0 \\ \therefore \frac{(x - 4)(x + 4)}{(x + 2)} &\leq 0 \\ \therefore x &\leq -4 \text{ or } -2 < x \leq 4 \end{aligned}$$



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