Higher Unit 1 Course Assessment Paper 2 Marking

Bad form: penalise once per question

Poor notation: penalise once per question

No units: penalise once per question

Total /39

Total Papers 1 + 2 = 70

1 (a) $m_{AB} = \frac{1+3}{-1+3}$ $= \underline{\underline{2}}$ ✓

$m_{BC} = \frac{-3-1}{7+1}$ $= \underline{\underline{-\frac{1}{2}}}$ ✓

✓ $m_{AB} \cdot m_{BC} = 2 \times -\frac{1}{2}$ $= -1$ Statement required

$\Rightarrow$ BC $\perp^{or}$ AB $\therefore$ $\Delta ABC$ right-angled

(b) (i) $D\left(\frac{-1+7}{2}, \frac{1-3}{2}\right)$ $= D(3,-1)$ ✓ Both needed

$E(2,-3)$

$m_{AD} = \frac{-3+1}{-3-3}$ $= \frac{1}{3}$ ✓

$m_{BE} = \frac{1+3}{-1-2}$ $= -\frac{4}{3}$ ✓

Eqn AD:-

$y - b = m(x-a)$

$y + 3 = \frac{1}{3}(x+3)$ ✓ or equivalent

$3y + 9 = x + 3$

$3y = x - 6$

Eqn. BE:-

$y - b = m(x-a)$

$y - 1 = -\frac{4}{3}(x+1)$ ✓ or equivalent

$3y - 3 = -4x - 4$

$3y = -4x - 1$

(ii) For M: $3y = x - 6$ --- ① ✓ for method

$3y = -4x - 1$ --- ②

$0 = 5x - 5$

$x = 1$ ✓

$\Rightarrow y = -\frac{5}{3}$

$\therefore M\left(1, -\frac{5}{3}\right)$ ✓ for co-ords

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2. $H(x) = g(f(x))$

$= g(2x+3)$ ✓

$= \dfrac{(2x+3)^2 + 25}{(2x+3)^2 - 25}$ ✓ for correct subst

$= \dfrac{4x^2 + 12x + 9 + 25}{4x^2 + 12x + 9 - 25}$

$= \dfrac{4x^2 + 12x + 34}{4x^2 + 12x - 16}$

$H(x)$ undefined when $4x^2 + 12x - 16 = 0$ ✓ for method

$4(x^2 + 3x - 4) = 0$

$4(x-1)(x+4) = 0$

$\underline{\underline{x = -4, 1}}$ ✓

4

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3. (a) Drug levels at:

10 am : Level = 50 units ✓ for 0.875 or $87\frac{1}{2}\%$

11 am : = 43.75 units

12 noon : = 38.28.. units

1 pm : = 33.496.. units

2 pm : = $\underline{\underline{29.3 \text{ units}}}$ (to 3 sf) ✓

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(b) $u_{n+1} = (0.875)^4 u_n + 50$ $u_{n+1}$ = drug level immediately after injections

$= 0.586 u_n + 50$ ✓

Since $-1 < a < 1$, limit, L, reached as $n \to \infty$

$L = \dfrac{b}{1-a}$ ✓

$= \dfrac{50}{1-0.586} = \underline{\underline{120.8 \text{ units}}}$

Yes, treatment safe, since max level is less than 125 units ✓ for justification

4/ (a) $V = \pi r^2 h$

$\Rightarrow 400 = \pi r^2 h$

$\therefore \quad h = \dfrac{400}{\pi r^2}$ ✓

(b) $A(r) = A_{base} + A_{dome} + A_{body}$

$= \pi r^2 + 2\pi r^2 + 2\pi r h$ ✓ either or equivalent

$= 3\pi r^2 + 2\pi r^2 \times \dfrac{400}{\pi r^2}$

$= \underline{\underline{3\pi r^2 + \dfrac{800}{r}}}$ ✓ Both needed

(c) $A(r) = 3\pi r^2 + 800 r^{-1}$ ✓

$A'(r) = 6\pi r - 800 r^{-2}$

$= 6\pi r - \dfrac{800}{r^2}$ ✓

For min A, $A'(r) = 0$ ✓

$\Rightarrow 6\pi r - \dfrac{800}{r^2} = 0$ ✓

$6\pi r = \dfrac{800}{r^2}$

$r^3 = \dfrac{800}{6\pi}$

$r = \underline{\underline{3.5}}$ (to 1 dp) ✓

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| $r$ | $\rightarrow$ | 3.5 | $\rightarrow$ |
|---|---|---|---|
| $A'(r)$ | $-$ | 0 | $+$ |
| Shape | \ | — | / |

✓ Table + statement needed

$\therefore$ Min A, when $r = \underline{\underline{3.5}}$ cm (to 1dp)

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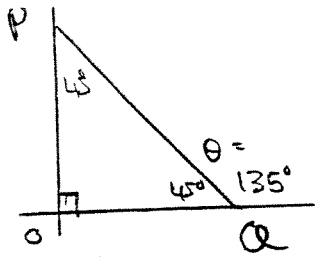
(a)




$m_{PQ} = \tan 135°$

$= -1$ ✓

$y = \dfrac{4}{x^2}$

$= 4x^{-2}$ ✓

$\dfrac{dy}{dx} = -8x^{-3}$ ✓

$= -\dfrac{8}{x^3}$

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$m_{tgt} = m_{PQ} = -\dfrac{8}{x^3} = -1$ ✓

$x^3 = 8$

$x = 2$

$\Rightarrow y = 1$

$\Rightarrow$ Pt of contact $\underline{\underline{(2,1)}}$ ✓ Co-ords needed

(b) Eqn PQ: $y - b = m(x-a)$

$y - 1 = -1(x-2)$

$y - 1 = -x + 2$

$\underline{\underline{y + x = 3}}$ ✓

or equivalent

At A: $y = 3$

$\Rightarrow 3 = \dfrac{4}{x^2}$

$x^2 = \dfrac{4}{3}$

$x = \cancel{-\dfrac{2}{\sqrt{3}}}$ NA ✓ or $\dfrac{2}{\sqrt{3}}$ or $\dfrac{2\sqrt{3}}{3}$ or $\approx 1.15$

$\underline{\underline{A\left(\dfrac{2}{\sqrt{3}}, 3\right)}}$

At B: $x = 3$

$\Rightarrow y = \dfrac{4}{3^2}$

$= \dfrac{4}{9}$

$\Rightarrow \underline{\underline{B\left(3, \dfrac{4}{9}\right)}}$

✓ for method to find A and/or B.

✓ for co-ords of A AND B.