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ai) $f(x) = (x+2)(x^2+4)$

$= x^3 + 4x + 2x^2 + 8$

$\therefore f'(x) = 3x^2 + 4 + 4x$

Stpts. $y' = 0$.

$0 = 3x^2 + 4x + 4$

$0 = x^2 + 6x + 2x + 12$

$= x(x+6) + 2(x+6)$

$\therefore 0 = (x+6)(x+2)$

$\therefore 0 \neq -6$ and $\therefore 0 \neq -2$.

$\therefore$ no stationary points.

ii) Max/Min $y'' = 0$

$y' = 3x^2 + 4 + 4x$

$y'' = 6x + 4$

$0 = 6x + 4$

$6x = -4$

$\therefore x = -\frac{2}{3}$ $\therefore < 0$ $\therefore$ max [redacted].

$y'' = 6x + 4$ (at $x = \frac{1}{3}$)

$0 = 6 \times (\frac{1}{3}) + 4$

$\therefore y'' = 6$ $\therefore > 0$ $\therefore$ min.

Cont →

iii) sub. at $x = -\frac{2}{3}$:

$y = x^3 + 4x + 2x^2 + 8$

$= \left(\frac{2}{3}\right)^3 + 4x - \frac{2}{3} + 2x\left(-\frac{2}{3}\right)^2 + 8$

$\therefore y = 5\frac{25}{27}$ or 5.9.

$\therefore \left(-\frac{2}{3}, 5\frac{25}{27}\right)$

Sub at $x = \frac{1}{3}$

$y = x^3 + 4x + 2x^2 + 8$

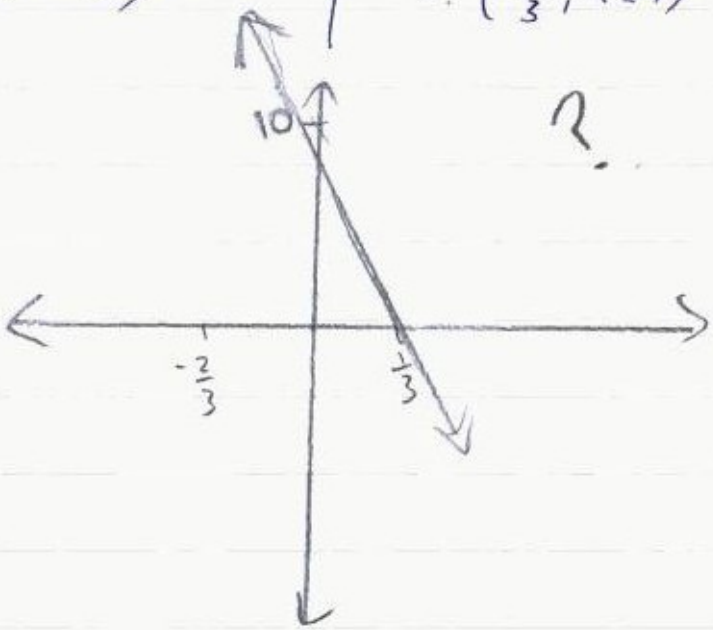
$= \left(\frac{1}{3}\right)^3 + 4 \times \frac{1}{3} + 2 \times \left(\frac{1}{3}\right)^2 + 8$

$\therefore y = 9\frac{16}{27}$ or 9.59

rounded up = 10.

$\therefore \left(\frac{1}{3}, 9\frac{16}{27}\right)$

2.



b) i) $\theta = rl$

$= \frac{9 \times 5}{60}$

$\therefore = \frac{\pi}{4}$.

ii) In Δ's OPT and OQT,

PO = OQ (radius = 5cm)

$\angle OPT = \angle OQT$ (90°, given)

$\angle OTP = \angle OTQ$ (perpendicular from P and Q).

$\therefore \Delta OPT$ is congruent to ΔOQT.

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iii) PT = pythag. theorem

$b^2 = c^2 - a^2$

$5^2 = c^2 - a^2$ $\therefore 25 = c^2 - a^2$?

iv) Area of a segment =

$\frac{1}{2} r^2 (\theta - \sin\theta)$

$= \frac{1}{2} \times 5^2 \left(\frac{\pi}{4} - \sin\frac{\pi}{4}\right)$

$= 0.978642\ldots$

$\therefore = 0.9786$ (4dp)