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

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

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

$\Delta = b^2 - 4ac$

$= 4^2 - 4(3)(4)$

$= 16 - 48$

$= -32$

∴ there are no real solutions for $f'(x) = 0$

∴ $y = f(x)$ has no stationary points.

aii) find POIs (points of inflexion)

$f''(x) = 6x + 4$

$0 = 6x + 4$

$6x = -4$

$x = -\frac{2}{3}$

$f''(0) = 6(0) + 4$

$= 4 > 0$ ∴ concave up

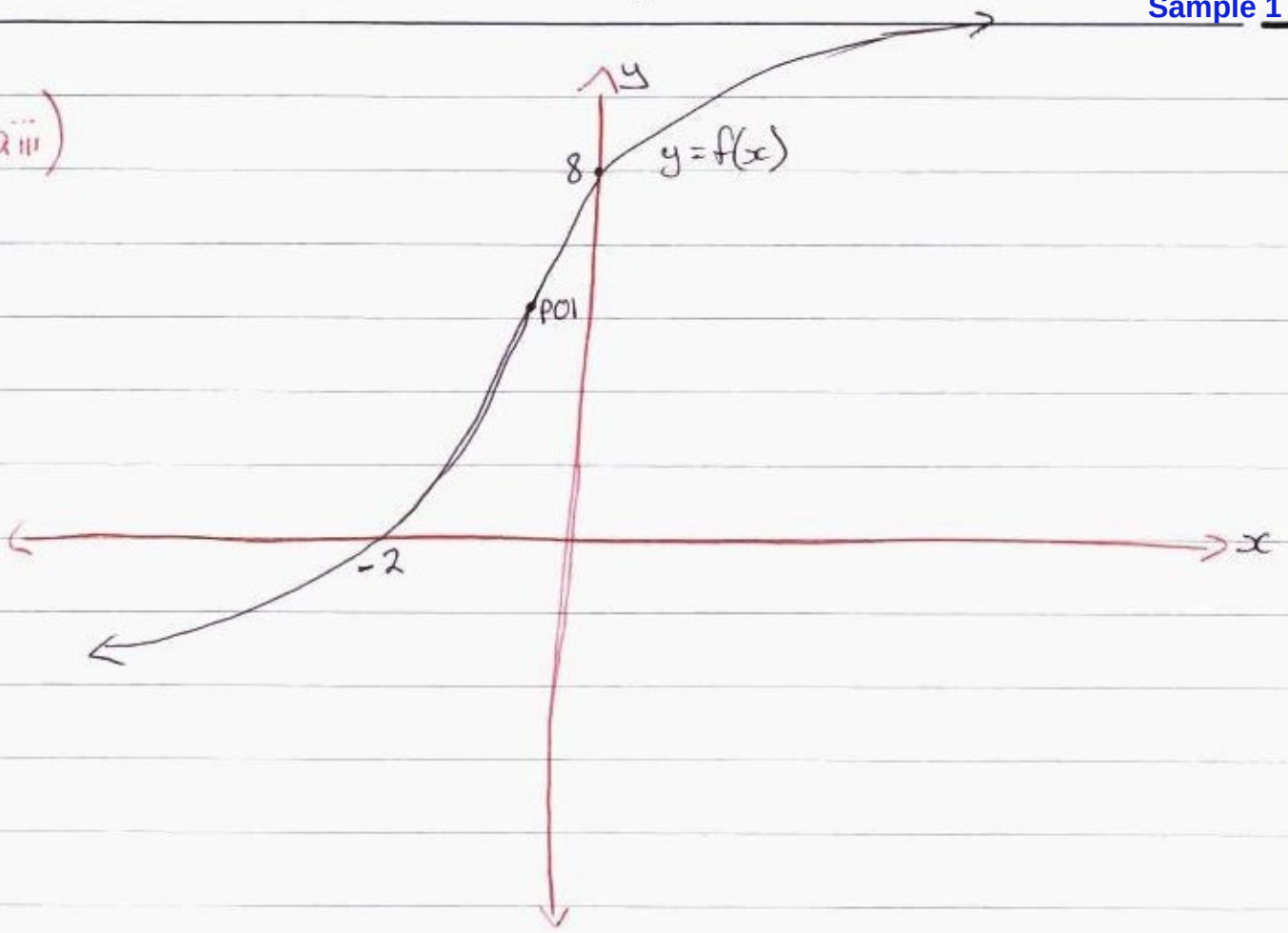
$f''(-1) = -6 + 4$

$= -2 < 0$ ∴ concave down

∴ $y = f(x)$ is concave up when $x > -\frac{2}{3}$

$y = f(x)$ is concave down when $x < -\frac{2}{3}$

a iii)



$0 = x^3 + 2x^2 + 4x + 8$

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

$x = -2, -2, 2$

bi) $l = \theta r$

$9 = \theta \times 5$

$\theta = \frac{9}{5} = 1.8^c$

bii) In $\triangle OPT$ and $\triangle OQT$:

OT is common

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

$OP = OQ$ (both radii of the same circle

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b iii) ~~by Sine rule:~~ $\angle PTO = \pi - \left(\frac{\pi}{2} + 0.9\right)$

$= 0.67^c$

~~$\frac{PT}{\sin 0.9^c} = 2$~~ by sine rule:

$$\frac{PT}{\sin 0.9^c} = \frac{5}{\sin 0.67^c}$$

$$PT = \frac{5 \sin 0.9^c}{\sin 0.67^c}$$

$$PT = 6.3 \text{ cm}$$

b iv) Area $= 2 \times \frac{1}{2} \times 5 \times 6.3 \times \sin 90° - \frac{1.8 \times 5}{2}$

$= 31.5 - 4.5$

$= 27 \text{ cm}^2$

You may ask for an extra Writing Booklet if you need more space to answer question 6.