Start here for
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a) (i) $f(x) = (x+2)(x^2+4)$

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

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

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

$\therefore$ no possible stationary points, as;

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$= \frac{-(4) \pm \sqrt{16 - 4(3)(4)}}{2(3)}$$

$$= \frac{-4 \pm \sqrt{-32}}{6}$$

$\therefore$ No stationary points exist on the curve.

(ii) $y = f(x)$

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

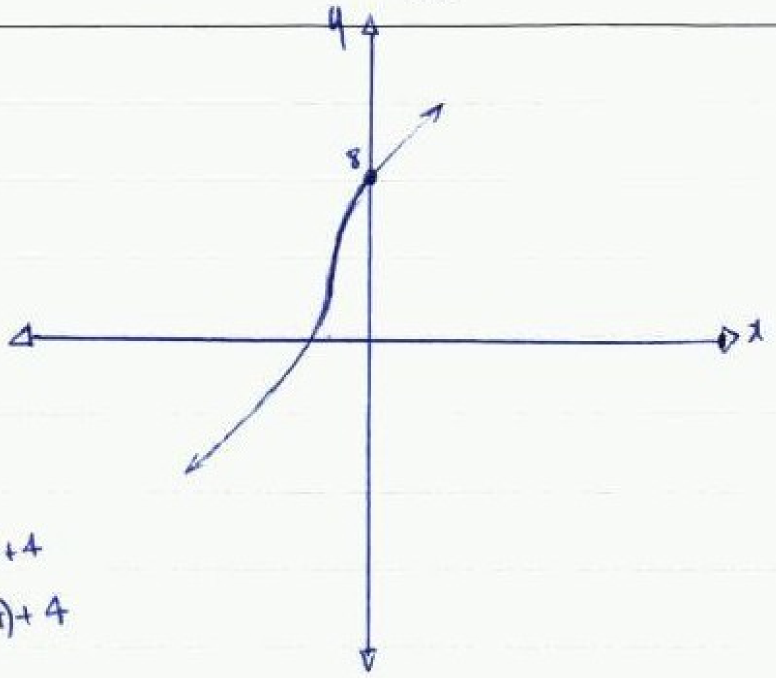
$y'' = 6x + 4$

$6x = -4$

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

$\therefore$ when $x > -\frac{2}{3}$ the graph concave down, and $x < -\frac{2}{3}$ the graph is concave up.

(iii)



$x\text{-int} = 3x^2 + 4x + 4$
$= x(3x+4) + 4$
$=$

(b) (i) $\angle POQ = l = r\theta$
$9 = 5\theta$
$\theta = \frac{9}{5} \times \frac{\pi}{\cancel{180}}$
$= \frac{9\pi}{5}$

(ii) In ΔOPT and ΔOQT:
$OP = OQ = 5$ cm (radii of circle)
$\angle OPQ = \angle OQP = 90°$ (given)
$OT = OT =$ bisector (common)
$\therefore$ due to SAS $\Delta OPT \equiv \Delta OQT$

(iii) $\tan\left(\frac{9\pi}{5}\right) = \frac{PT}{5}$
$\tan \frac{18\pi}{5} = \frac{PT}{5}$
$PT = 6.499\ldots$
$\therefore PT$ is 6.5 cm

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

$= \frac{1}{2} \cdot 5^2\left(\frac{9\pi}{5} - \sin\frac{9\pi}{5}\right)$

$= \frac{25}{2}\left(\frac{9\pi}{5} - \sin\frac{9\pi}{5}\right)$

$= \frac{22\pi}{10} - \sin\frac{22\pi}{10}$

= Area of sector

Hence,

Area of kite:

$\frac{1}{2} \times y \times x$

$= \frac{1}{2} \times 8.2 \times x$

$= 4.1x$

$\therefore 4.1x - \frac{22\pi}{10} - \sin\frac{22\pi}{10}$ = Shaded region.