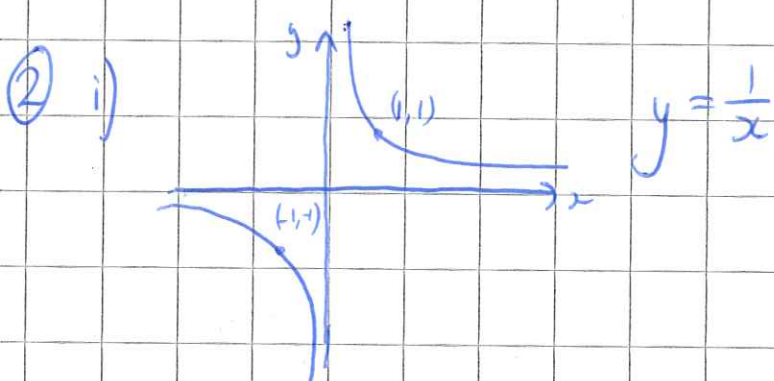


June 2011 (C1)

$$\begin{aligned} \textcircled{1} \quad 3x^2 - 18x + 4 &= 3(x^2 - 6x) + 4 \\ &= 3((x-3)^2 - 9) + 4 \\ &= 3(x-3)^2 - 27 + 4 \\ &= 3(x-3)^2 - 23 \end{aligned}$$



ii)  $y = \frac{1}{4x} \Rightarrow y = \frac{1}{x} + 4$  Translation of 4 in the positive  $y$ -direction

$$\textcircled{3} \text{ i) } \frac{(4x)^2 \times 2x^3}{x} = \frac{16x^2 \times 2x^3}{x} = \frac{32x^5}{x} = 32x^4$$

$$\text{ii) } (36x^{-2})^{-1/2} = \frac{1}{\sqrt{36}} x = \frac{1}{6} x$$

$$\textcircled{4} \quad y = 2(x-2)^2 \textcircled{1} \quad 3x + y = 26 \textcircled{2}$$

Sub  $\textcircled{1}$  into  $\textcircled{2}$

$$3x + 2(x-2)^2 = 26$$
$$3x + 2(x^2 - 4x + 4) = 26$$
$$3x + 2x^2 - 8x + 8 = 26$$
$$2x^2 - 5x + 8 = 26$$
$$2x^2 - 5x - 18 = 0$$
$$(2x - 9)(x + 2) = 0$$

$$2x = 9 \quad \underline{x = -2}$$

$$\underline{x = 4.5}$$

$$y = 2(-4)^2$$
$$\underline{y = 32}$$

$$x = 4.5$$

$$y = 2\left(\frac{5}{2}\right)^2$$
$$y = \frac{50}{4}$$
$$\underline{y = \frac{25}{2}}$$

$$\textcircled{5} \text{ i) } \sqrt{300} - \sqrt{48} = 10\sqrt{3} - 4\sqrt{3}$$
$$= 6\sqrt{3}$$

$$\text{ii) } \frac{15 + \sqrt{40}}{\sqrt{5}} \times \frac{\sqrt{5}}{\sqrt{5}} = \frac{15\sqrt{5} + \sqrt{40}\sqrt{5}}{5}$$
$$= \frac{15\sqrt{5} + \sqrt{200}}{5}$$
$$= \frac{15\sqrt{5} + 10\sqrt{2}}{5}$$
$$= 3\sqrt{5} + 2\sqrt{2}$$

$$\textcircled{6} \quad 3x^{1/2} - 8x^{1/4} + 4 = 0$$

$$\text{let } y = x^{1/4}$$

$$3y^2 - 8y + 4 = 0$$

$$(3y - 2)(y - 2) = 0$$

$$3y - 2 = 0$$

$$3y = 2$$

$$y = \frac{2}{3}$$

$$x^{1/4} = \frac{2}{3}$$

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

$$\underline{x = \frac{16}{81}}$$

$$y - 2 = 0$$

$$y = 2$$

$$x^{1/4} = 2$$

$$x = 2^4$$

$$\underline{x = 16}$$

$$\textcircled{7} \text{ i) } -9 \leq 6x + 5 \leq 0$$

$$-14 \leq 6x \leq -5$$

$$\underline{\underline{\frac{-14}{6} \leq x \leq \frac{-5}{6}}}$$

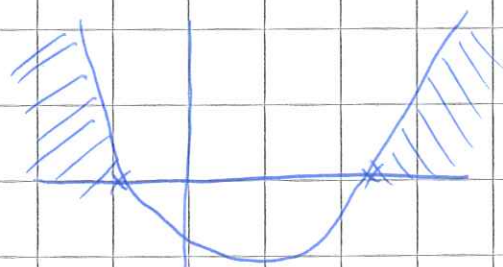
$$\text{ii) } 6x + 5 < x^2 + 2x - 7$$

$$0 < x^2 - 4x - 12$$

$$0 < (x - 6)(x + 2)$$

$$x > 6$$

$$x < -2$$



$$\textcircled{8} \text{ i) } y = 3x^2 - \frac{6}{x} - 2$$

$$y = 3x^2 - 6x^{-1} - 2$$

$$\frac{dy}{dx} = 6x + 6x^{-2} \quad \text{@ stationary point.}$$

$$\frac{dy}{dx} = 0$$

$$6x + \frac{6}{x} = 0$$

$$\underline{\underline{x = -1}}$$

$$y = 3(-1)^2 - \frac{6}{-1} - 2$$

$$y = 3 + 6 - 2$$

$$\underline{\underline{y = 7}}$$

$$(-1, 7)$$

$$\text{ii) } \frac{d^2y}{dx^2} = 6 - 12x^{-3} \quad \text{@ } x = -1$$

$$\frac{d^2y}{dx^2} = 6 - 12(-1)^{-3}$$

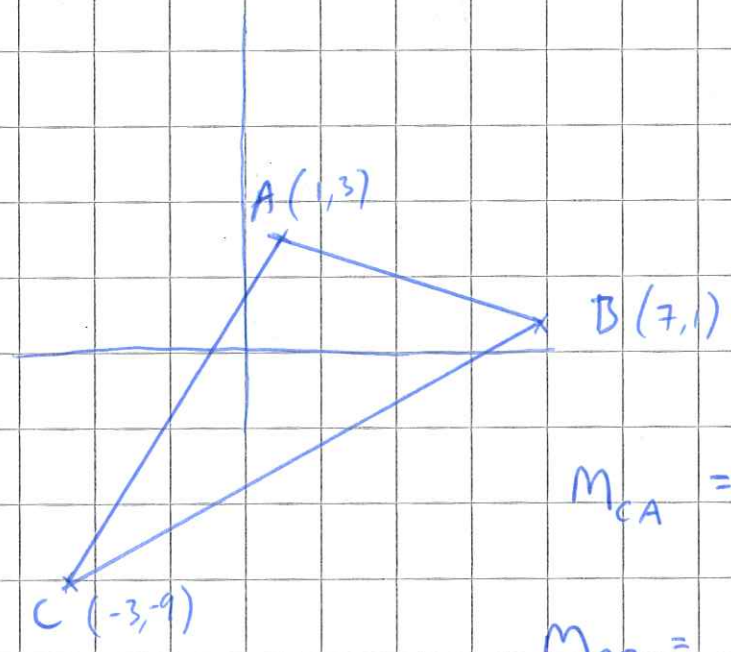
$$= 6 - \frac{12}{(-1)^3}$$

$$= 6 + 12 = 18$$

Hence min point.

9

i)



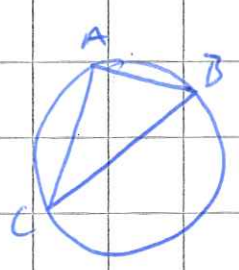
$$m_{CA} = \frac{\Delta y}{\Delta x} = \frac{3 - (-9)}{1 - (-3)} = \frac{12}{4} = 3$$

$$m_{AB} = \frac{\Delta y}{\Delta x} = \frac{-2}{6} = -\frac{1}{3}$$

$$m_{CA} \times m_{AB} = 3 \times -\frac{1}{3} = -1$$

Hence CA and AB are perpendicular, so the right angle is @ A.

ii)



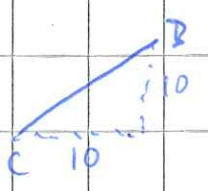
"Angle subtended in a semi circle is always 90°"

So CB is the diameter. The midpoint of CB is the centre.

Midpoint CB =  $\left( \frac{-3+7}{2}, \frac{-9+1}{2} \right) = (2, -4)$   
 centre  $\Rightarrow (2, -4)$  radius is half of CB

~~CB~~  $CB = \sqrt{10^2 + 10^2}$   
 $= \sqrt{200}$   
 $CB = 10\sqrt{2}$

$\therefore$  radius =  $\frac{1}{2} CB$   
 $= 5\sqrt{2}$



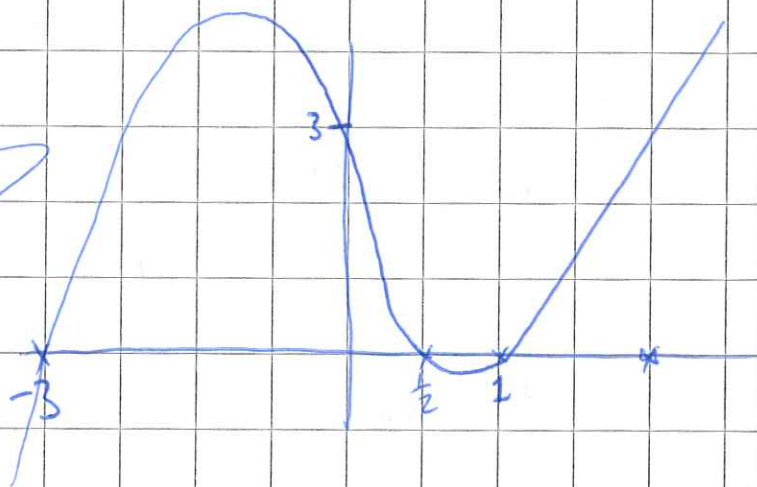
eqn of circle:

$$(x-2)^2 + (y+4)^2 = (5\sqrt{2})^2$$

$$x^2 - 4x + 4 + y^2 + 8y + 16 = 50$$

$$x^2 + y^2 - 4x + 8y - 30 = 0$$

$$(10) \quad y = (2x-1)(x+3)(x-1)$$



$$y = (2x-1)(x^2+2x-3)$$

$$y = 2x^3 + 4x^2 - 6x - x^2 - 2x + 3$$

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

$$\frac{dy}{dx} = 6x^2 + 6x - 8 \quad @ \quad P(1,0) \quad x=1$$

$$\begin{aligned} \therefore \frac{dy}{dx} &= 6(1)^2 + 6(1) - 8 \\ &= 12 - 8 \\ &= 4 \end{aligned}$$

iii) gradient of  $l = 4$

$$x = -2$$

so

$$y = -5 \times 1 \times -3$$
$$y = 15$$

hence

$$15 = 4(-2) + c$$

$$15 = -8 + c$$

$$c = 23$$

$$\therefore y = 4x + 23$$

iv) @  $x = -2$   $\frac{dy}{dx} = 6(-2)^2 + 6(-2) - 8$

$$= 24 - 12 - 8$$

$$= 4$$

Because the gradient of  $l$  is 4, then  
 $l$  must be a tangent @  $x = -2$

