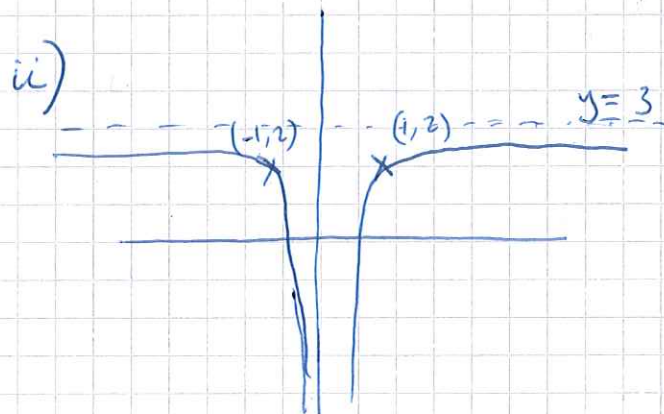
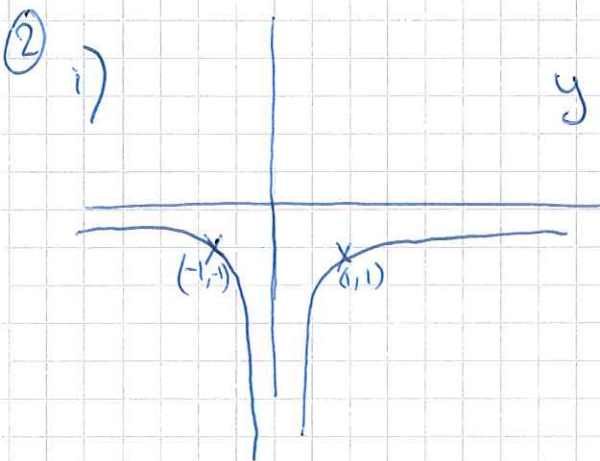


June 2010 - Core 1

① a) $9^0 = 1$
ii) $9^{-\frac{1}{2}} = \frac{1}{\sqrt{9}} = \frac{1}{3}$

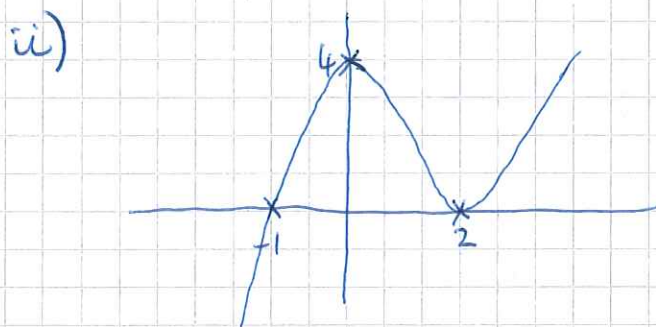


iii) $y = \frac{-2}{x^2}$

③ i) $\frac{12}{3+\sqrt{5}} \times \frac{3-\sqrt{5}}{3-\sqrt{5}} = \frac{36-12\sqrt{5}}{9-5} = \frac{36-12\sqrt{5}}{4} = 9-3\sqrt{5}$

ii) $\sqrt{18} - \sqrt{2} = 3\sqrt{2} - \sqrt{2} = 2\sqrt{2}$

④ i) $x^2 - 4x + 4(x+1) = x^3 - 4x^2 + 4x + x^2 - 4x + 4$
 $\frac{x^3 - 4x^2 + 4x + x^2 - 4x + 4}{x^3 - 3x^2 + 4}$



$$\textcircled{5} \text{ let } x^4 = y^2$$

$$4y^2 + 3y - 1 = 0$$

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

$$4y^2 - y + 4y - 1$$

$$4y - 1 = 0$$

$$y = \frac{1}{4}$$

$$y + 1 = 0$$

$$y = -1$$

$$y = x^2$$

$$\therefore x^2 = \frac{1}{4}$$

$$x^2 \neq -1$$

$$x = \pm \frac{1}{2}$$

$$\textcircled{6} \quad y = 2x + \frac{6}{\sqrt{x}}$$

$$y = 2x + 6x^{-1/2}$$

$$\frac{dy}{dx} = 2 - 3x^{-3/2}$$

$$\textcircled{a} \quad x = 4 \quad \frac{dy}{dx} = 2 - 3\left(\frac{1}{\sqrt{4^3}}\right)$$

$$= 2 - \frac{3}{8}$$

$$= \frac{15}{8} = \frac{13}{8}$$

$$\textcircled{7} \quad x + 2y - 6 = 0$$

$$2x^2 + y^2 = 57$$

$$x = 6 - 2y$$

$$2(6 - 2y)^2 + y^2 = 57$$

$$2(36 - 24y + 4y^2) + y^2 = 57$$

$$72 - 48y + 8y^2 = 57$$

$$9y^2 - 48y + 15 = 0$$

$$3y^2 - 16y + 5 = 0$$

$$(3y - 1)(y - 5) = 0$$

$$3y - 1 = 0$$

$$y = \frac{1}{3}$$

$$\underline{y = 5}$$

$$\underline{x = -4}$$

$$\underline{x = \frac{16}{3}}$$

$$\begin{aligned} \textcircled{8} \text{ i) } 2x^2 + 5x &= 2 \left(x^2 + \frac{5}{2}x \right) \\ &= 2 \left(\left(x + \frac{5}{4} \right)^2 - \frac{25}{16} \right) \\ &= 2 \left(x + \frac{5}{4} \right)^2 - \frac{50}{16} \end{aligned}$$

$$\text{ii) Min point} = \left(-\frac{5}{4}, -\frac{50}{16} \right)$$

$$\text{iii) } \frac{dy}{dx} = 4x + 5 \quad @ \quad x = -\frac{5}{4} \quad \frac{dy}{dx} = 0$$

$$\text{hence normal} \Rightarrow x = -\frac{5}{4}$$

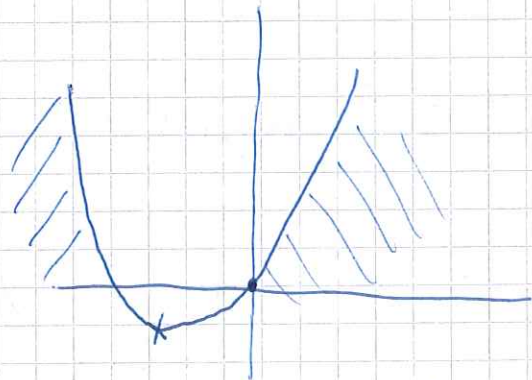
$$\text{iv) } 2x^2 + 5x > 0$$

$$x(2x + 5) > 0$$

$$x = 0$$

$$2x + 5 = 0$$

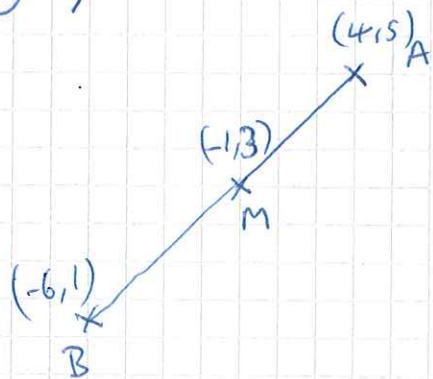
$$x = -\frac{5}{2}$$



$$x > 0$$

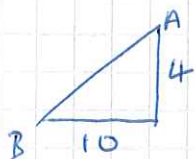
$$x < -\frac{5}{2}$$

9) i)



B(-6, 1)

ii)



$$AB = \sqrt{10^2 + 4^2}$$

$$= \sqrt{116}$$

$$AM = \sqrt{\frac{116}{4}} = \sqrt{29}$$

iii) $(x+1)^2 + (y-3)^2 = \cancel{116} \ 29$

$$x^2 + 2x + 1 + y^2 - 6y + 9 = \cancel{116} \ 29$$

$$x^2 + y^2 + 2x - 6y - \frac{106}{19} = 0$$

iv) gradient of ~~tangent~~ ^{radius} = $\frac{3-5}{-1-4} = \frac{2}{5}$

gradient of tangent = $-\frac{5}{2}$

$$y - 5 = -\frac{5}{2}(x - 4)$$

$$y = -\frac{5}{2}x + 15$$

10)

i) $y = 2x^3 + 5x^2 - 4x$

$$\frac{dy}{dx} = 6x^2 + 10x - 4$$

@ stationary point $\frac{dy}{dx} = 0$

$$0 = 6x^2 + 10x - 4$$

$$0 = 3x^2 + 5x - 2$$

$$0 = (3x-1)(x+2)$$

$$3x-1=0$$

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

$$x+2=0$$

$$x = -2$$

$$y = \cancel{\frac{17}{27}} \frac{2}{27} + \frac{5}{9} - \frac{4}{3}$$

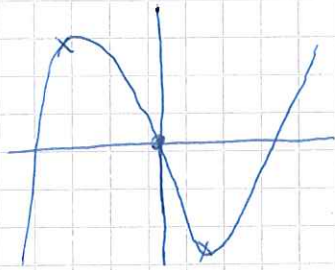
$$y = 2(-2)^3 + 5(-2)^2 - 4(-2)$$

$$y = 12$$

$$\left(\frac{1}{3}, -\frac{19}{27}\right) \text{ and } (-2, 12)$$

$$y = -\frac{19}{27}$$

10) ii)



$$-2 < x < \frac{1}{3}$$

iii) $\frac{dy}{dx} = 6\left(\frac{1}{2}\right)^2 + 10\left(\frac{1}{2}\right) - 4$ @ $x = \frac{1}{2}$

$$= \frac{6}{4} + 5 - 4$$

$$= \frac{10}{4}$$

$$m = \frac{5}{2}$$

$$y = 2\left(\frac{1}{2}\right)^3 + 5\left(\frac{1}{2}\right)^2 - 4\left(\frac{1}{2}\right)$$

$$= \frac{2}{8} + \frac{5}{4} - 2$$

$$= \frac{6}{4} - 2$$

$$= -\frac{1}{2}$$

$$-\frac{1}{2} = \frac{5}{2}\left(\frac{1}{2}\right) + c$$

$$-\frac{1}{2} = \frac{5}{4} + c$$

$$-\frac{7}{4} = c$$

$$y = \frac{5}{2}x - \frac{7}{4}$$

$$4y = 10x - 7$$

$$10x - 4y - 7 = 0$$

iv)

