

**Edexcel**

**A Level**

# **A Level Maths**

**Edexcel Core Maths C1 January  
2013 Model Solutions**

Name:



**Mathsmadeeasy.co.uk**

Total Marks:

Edexcel Jan 13 C1

$$1. \quad x - 4x^3 = x(1 - 4x^2) \\ = x(1 + 2x)(1 - 2x)$$

$$2. \quad 8^{2x+3} = (2^3)^{2x+3} = 2^{6x+9} \\ \therefore y = 6x + 9$$

$$3. \quad (5 - \sqrt{8})(1 + \sqrt{2}) = 5 + 5\sqrt{2} - \sqrt{8} - \sqrt{16} \\ = 5 + 5\sqrt{2} - 2\sqrt{2} - 4 \\ = 1 + 3\sqrt{2}$$

$$3. \quad \sqrt{80} + \frac{30}{\sqrt{5}} \\ = \sqrt{16 \times 5} + \frac{30\sqrt{5}}{5} \\ = 4\sqrt{5} + 6\sqrt{5} \\ = 10\sqrt{5}$$

$$4a. \quad u_{n+1} = 2u_n - 1, \quad u_2 = 9 \\ u_3 = 2u_2 - 1 \\ = 2(9) - 1 \\ = 17 \\ u_4 = 2u_3 - 1 \\ = 2(17) - 1 \\ = 33$$

$$4b. \quad \sum_{r=1}^4 u_r = u_1 + u_2 + u_3 + u_4$$

$$u_2 = 2u_1 - 1$$

$$9 = 2u_1 - 1$$

$$\therefore u_1 = 5$$

$$\sum_{r=1}^4 u_r = 5 + 9 + 17 + 33 \\ = 64$$

5a.  $l_1: y = -2x + 3 \Rightarrow m = -2$

$\therefore m \text{ of } l_2 = \frac{1}{2} \text{ (since } \perp)$

$$y - 6 = \frac{1}{2}(x - 5)$$

$$2y - 12 = x - 5$$

$$x - 2y + 7 = 0$$

5b. when  $x = 0$  ;  $0 - 2y + 7 = 0$

$$2y = 7$$

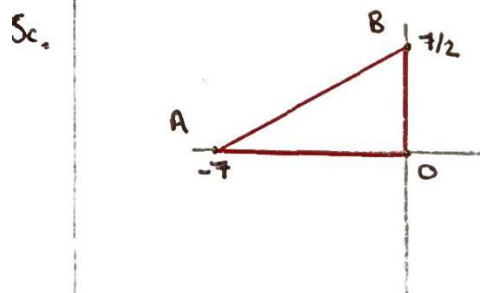
$$y = 7/2$$

$\therefore B \text{ at } (0, 7/2)$

when  $y = 0$  ;  $x - 0 + 7 = 0$

$$x = -7$$

$\therefore A \text{ at } (-7, 0)$

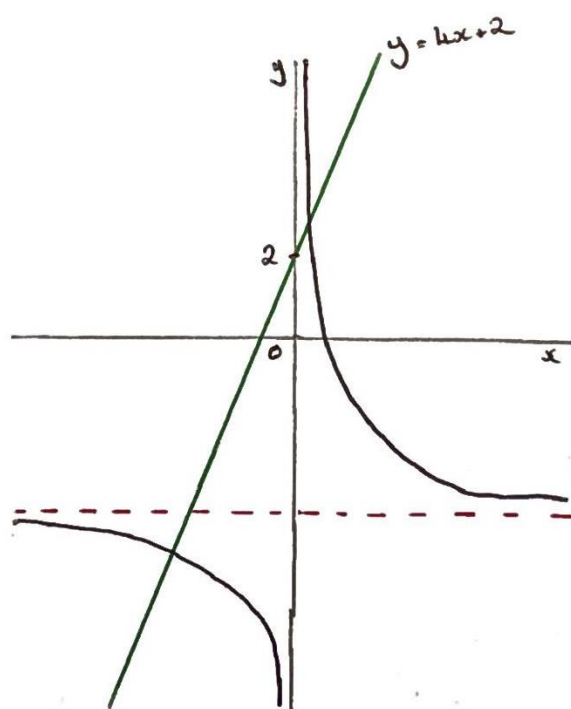


$$A = \frac{1}{2}(b \times h)$$

$$= \frac{1}{2}(7 \times 7/2)$$

$$= \frac{49}{4}$$

6a.  $y = \frac{2}{x} - 5 \Rightarrow y = \frac{2}{x}$  'translated down 5 units'



6b. Asymptotes :  $x = 0$   
 $y = -5$

6c.  $y = \frac{2}{x} - 5$  ①,  $y = 4x + 2$  ②

'Equate ① and ②'

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

$$4x + 7 - \frac{2}{x} = 0 \quad \times x$$

$$4x^2 + 7x - 2 = 0$$

$$(4x - 1)(x + 2) = 0$$

$$x = -2 \quad \text{or} \quad x = \frac{1}{4}$$

when  $x = -2$  ;  $y = 4(-2) + 2$   
 $= -8 + 2$   
 $= -6$

when  $x = \frac{1}{4}$  ;  $y = 4(\frac{1}{4}) + 2$   
 $= 1 + 2$   
 $= 3$

$\therefore$  coordinates at  $(-2, -6)$  and  $(\frac{1}{4}, 3)$

7a. AP  $a = 140$  ,  $d = 20$

$$\begin{aligned} U_{20} &= a + (20-1)d \\ &= 140 + 19(20) \\ &= 140 + 380 \\ &= 520 \end{aligned}$$

7b.  $S_{20} = \frac{1}{2}(20)(a + l)$  'l is the last term'  
 $= 10(140 + 520)$   
 $= 6600$

7c. AP       $a = 300$        $l = 700$        $S_n = 8500$

$$S_n = \frac{1}{2}n(a+l) = 8500$$

$$\frac{1}{2}n(300+700) = 8500$$

$$500n = 8500$$

$$n = 17$$

8.

$$\frac{dy}{dx} = -x^3 + \frac{4x-5}{2x^3}$$

$$= -x^3 + \frac{4x}{2x^3} - \frac{5}{2x^3}$$

$$= -x^3 + 2x^{-2} - \frac{5}{2}x^{-3}$$

$$y = \int \frac{dy}{dx} dx$$

$$= \int -x^3 + 2x^{-2} - \frac{5}{2}x^{-3} dx$$

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

when  $x=1$ ,  $y=7$

$$7 = -\frac{1}{4} - 2 + \frac{5}{4} + c$$

$$7 = -1 + c \Rightarrow c = 8$$

$$\therefore y = -\frac{1}{4}x^4 - 2x^{-1} + \frac{5}{4}x^{-2} + 8$$

9a.

$$(k+3)x^2 + 6x + k = 5$$

$$(k+3)x^2 + 6x + (k-5) = 0$$

$$a = (k+3), b = 6, c = (k-5)$$

2 d.r.s.  $\therefore b^2 - 4ac > 0$

$$6^2 - 4(k+3)(k-5) > 0$$

$$36 - 4(k^2 - 2k - 15) > 0$$

$$36 - 4k^2 + 8k + 60 > 0$$

$$4k^2 - 8k - 96 < 0$$

$$k^2 - 2k - 24 < 0$$

9b.  $(k-6)(k+4) < 0$

c.v.s  $k=6$   $k=-4$



$$\therefore -4 < k < 6$$

10a.  $4x^2 + 8x + 3 \equiv a(x+b)^2 + c$

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

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

$$4 \left( (x+1)^2 - \frac{1}{4} \right)$$

$$4(x+1)^2 - 1$$

$$\therefore a=4, b=1, c=-1$$

10b. when  $y=0$  ;  $4(x+1)^2 - 1 = 0$

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

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

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

$$\text{or } x = -\frac{1}{2} - 1 = -\frac{3}{2}$$

$\therefore$  crosses at

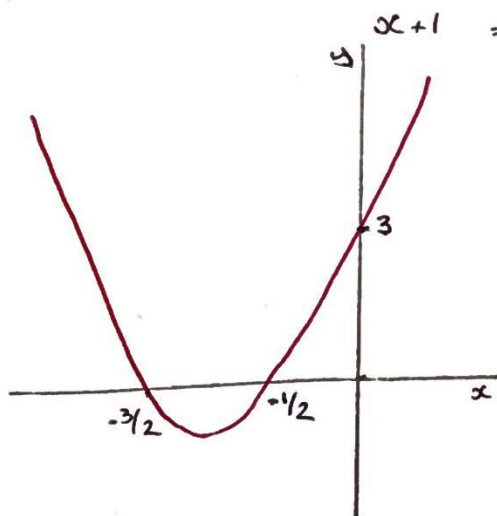
$$\left(-\frac{3}{2}, 0\right) \text{ and } \left(-\frac{1}{2}, 0\right)$$

when  $x=0$ ;

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

$$= 3$$

crosses at  $(0, 3)$



11a.

$$y = 2x + 8\sqrt{x} + 5$$

$$y = 2x + 8x^{1/2} + 5$$

$$\frac{dy}{dx} = 2 + 4x^{-1/2}$$

11b.

$$\text{When } x = \frac{1}{4}, \quad y = 2\left(\frac{1}{4}\right) + 8\sqrt{\frac{1}{4}} + 5$$

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

$$= \frac{3}{2} \quad \therefore P\left(\frac{1}{4}, \frac{3}{2}\right)$$

$$\text{When } x = \frac{1}{4}, \quad \frac{dy}{dx} = 2 - \frac{4}{\sqrt{\frac{1}{4}}}$$

$$= 2 - \frac{4}{\frac{1}{2}}$$

$$= -6$$

$$y - \frac{3}{2} = -6\left(x - \frac{1}{4}\right)$$

$$y - \frac{3}{2} = -6x + \frac{3}{2}$$

$$y = -6x + 3$$

11c.

$$2x - 3y + 18 = 0 \quad \Rightarrow \quad y = \frac{2}{3}x + 6$$

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

$$\text{Parallel } \therefore m \text{ of tangent} = \frac{2}{3}$$

$$\therefore 2 - \frac{4}{\sqrt{x}} = \frac{2}{3} \quad \left(\text{Set } \frac{dy}{dx} = \frac{2}{3}\right)$$

$$\frac{4}{\sqrt{x}} = \frac{4}{3}$$

$$\frac{\sqrt{x}}{4} = \frac{3}{4}$$

$$\sqrt{x} = 3$$

$$x = 9$$

$$\text{When } x = 9, \quad y = 2(9) + 8\sqrt{9} + 5$$

$$= 18 + 24 + 5$$

$$= -1$$

$$\therefore Q(9, -1)$$