Edexcel

A Level

A Level Maths

Edexcel Core Maths C1 January 2012 Model Solutions

Name:

MME
Mathsmadeeasy.co.uk

Total Marks:

Edexcel Jan 2012 : C1

1a. $y = x^4 + 6x^{1/2}$

$\frac{dy}{dx} = 4x^3 + 3x^{-1/2}$

1b. $\int x^4 + 6x^{1/2}\, dx$

$= \frac{1}{5}x^5 + \frac{6}{3/2}x^{3/2} + c$

$= \frac{1}{5}x^5 + 4x^{3/2} + c$

2a. $\sqrt{32} + \sqrt{18}$

$= \sqrt{2 \times 16} + \sqrt{2 \times 9}$

$= 4\sqrt{2} + 3\sqrt{2}$

$= 7\sqrt{2}$

2b. $\frac{\sqrt{32} + \sqrt{18}}{3 + \sqrt{2}}$

$\frac{7\sqrt{2}\,(3 - \sqrt{2})}{(3 + \sqrt{2})(3 - \sqrt{2})} = \frac{21\sqrt{2} - 14}{9 - 2}$

$= \frac{21\sqrt{2} - 14}{7}$

$= 3\sqrt{2} - 2$

3a. $4x - 5 > 15 - x$

$5x > 20$

$x > 4$

3b.

$x(x-4) > 12$

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

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

C.V.s $x = 6$ or -2

$x < -2$

$x > 6$

4a.

$x_{n+1} = ax_n + 5$

$x_1 = 1$

$x_2 = ax_1 + 5$

$= a(1) + 5$

$= a + 5$

4b.

$x_3 = ax_2 + 5$

$= a(a+5) + 5$

$= a^2 + 5a + 5$

4c.

$x_3 = 41$

$\therefore \quad a^2 + 5a + 5 = 41$

$a^2 + 5a - 36 = 0$

$(a+9)(a-4) = 0$

$a = -9$ or 4

5a.

$y = x(5-x)$ $\quad 2y = 5x + 4$ ②

$2y = 2x(5-x)$ ①

'Equate ① and ②'

$2x(5-x) = 5x + 4$

$10x - 2x^2 = 5x + 4$

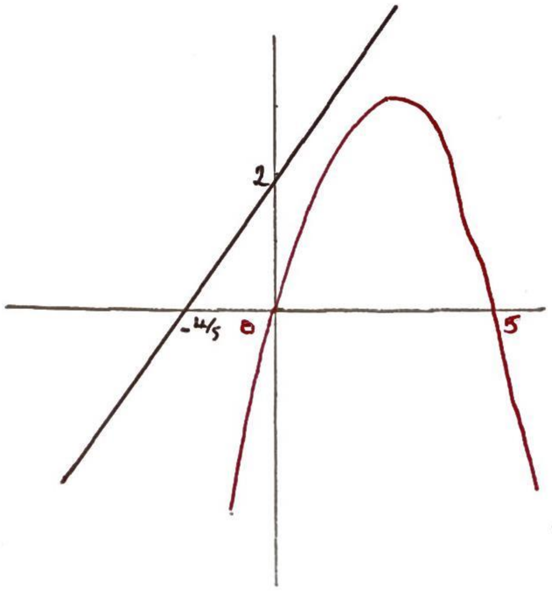
$2x^2 - 5x + 4 = 0$

$b^2 - 4ac$: $(-5)^2 - 4(2)(4)$

$= -7$

$-7 < 0 \Rightarrow$ no solution $\therefore$ no intersections

5b.



6a. l_1 : $2x - 3y + 12 = 0$

$3y = 2x + 12$

$y = \frac{2}{3}x + 4 \quad \therefore$ grad $= \frac{2}{3}$

6b. at B $x = 0$ $\quad y = 4$ $\quad$ B $(0, 4)$

$l_2 \perp \therefore$ grad $= -\frac{3}{2}$

l_2 : $y - 4 = -\frac{3}{2}(x - 0)$

$y - 4 = -\frac{3x}{2}$

6c. at C $y = 0 \quad \therefore -4 = -\frac{3}{2}x$

$x = \frac{8}{3} \quad$ C $(\frac{8}{3}, 0)$

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

$= \frac{1}{2}\left(\frac{8}{3} - -6\right) \times 4$

$= \frac{52}{3}$

at A $\quad y = 0$

$0 = \frac{2}{3}x + 4$

$\frac{2}{3}x = -4 \quad \therefore x = -6$

A $(-6, 0)$

7.

$$f'(x) = 3x^2 - 3x + 5$$

$$f(x) = \int 3x^2 - 3x + 5 \; dx$$

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

when $x = 2$, $f(x) = 10$

$$10 = 2^3 - \frac{3}{2}(2)^2 + 5(2) + c$$

$$10 = 8 - 6 + 10 + c$$

$$c = -2$$

$$\therefore \; f(x) = x^3 - \frac{3}{2}x^2 + 5x - 2$$

$$f(1) = 1 - \frac{3}{2} + 5 - 2$$

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

8a.

$$y = x^2(x+2)$$

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

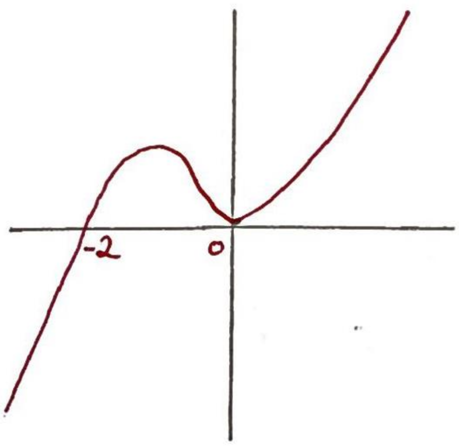
$$\frac{dy}{dx} = 3x^2 + 4x$$

8b.

$y = x^2(x+2)$ + cubic $\therefore$  shaped

root at $x = -2$

double root at $x = 0$



8c. at $x = 0$; $\frac{dy}{dx} = 3(0)^2 + 4(0)$

$= 0$

at $x = -2$; $\frac{dy}{dx} = 3(-2)^2 + 4(-2)$

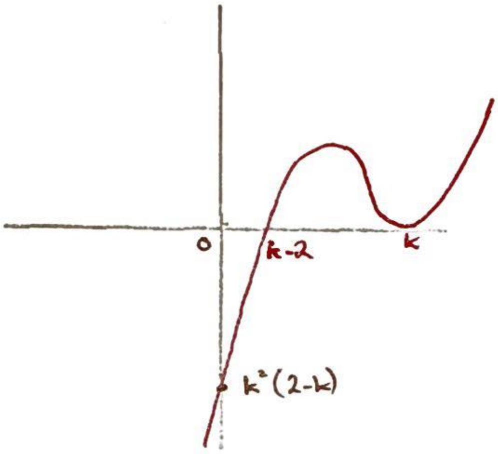
$= 12 - 8$

$= 4$

8d. $y = (x-k)^2(x-k+2)$

$f(x) \rightarrow f(x-k)$

translation k units right



when $x = 0$

$y = (0-k)^2(0-k+2)$

$= k^2(2-k)$

9a. S1 : $a = P$ $d = 2T$

S2 : $a = P + 1800$, $d = T$

$S_{10} = \frac{1}{2}(10)(2a + (10-1)d)$

$\therefore 5(2P + 9(2T))$

$= 10P + 90T$

9b. for S2, $S_{10} = 5(2(P+1800) + 9T)$

$= 10P + 18{,}000 + 45T$

$\cancel{10P} + 90T = \cancel{10P} + 18{,}000 + 45T$

$45T = 18{,}000$

$T = 400$

9c. $U_{10} = a + (10-1)d = 29{,}850$

$= P + 1800 + 9T$

$29{,}850 = P + 1800 + 9(400)$

$29{,}850 = P + 5400$

$P = 24{,}450$

10a. $y = 2 - \frac{1}{x}$

at A $y = 0$ $\therefore$ $0 = 2 - \frac{1}{x}$

$x = 1/2$ A $(1/2, 0)$

10b. $y = 2 - x^{-1}$

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

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

at A, $\frac{dy}{dx} = \frac{1}{(1/2)^2} = \frac{1}{1/4} = 4$

normal $\perp$ $\therefore$ grad of normal $= -1/4$

$y - 0 = -\frac{1}{4}(x - 1/2)$ $\times 4$

$4y = -(x - 1/2)$

$4y = -x + 1/2$ $\times 2$

$8y = -2x + 1$

$2x + 8y - 1 = 0$

10c. $2x + 8y - 1 = 0$ ①

$y = 2 - \frac{1}{x}$ ②

'Sub ② into ①'

$2x + 8\left(2 - \frac{1}{x}\right) - 1 = 0$

$2x + 16 - \frac{8}{x} - 1 = 0$

$2x + 15 - \frac{8}{x} = 0$ $\times x$

$2x^2 + 15x - 8 = 0$

$(2x - 1)(x + 8) = 0$

$x = 1/2$ or -8

at B $x = -8$

$y = 2 - \frac{1}{(-8)}$

$= 2 + \frac{1}{8}$

$= 17/8$

$\therefore$ B at $(-8, 17/8)$