Edexcel

A Level

A Level Maths

Edexcel Core Maths C1 June 2014 Model Solutions

Name:

Mathsmadeeasy.co.uk

Total Marks:

Edexcel June 14 C1

1. $\int 8x^3 + 4 \; dx$

$= 2x^4 + 4x + c$

2a. $32^{1/5} = \sqrt[5]{32} = 2$

$(32x^5)^{-2/5}$

$\left(\frac{1}{32x^5}\right)^{2/5} = \frac{1}{(32x^5)^{2/5}} = \frac{1}{(\sqrt[5]{32x^5})^2} = \frac{1}{(2x)^2} = \frac{1}{4x^2}$

3a. $3x - 7 > 3 - x$

$4x > 10$

$x > 5/2$

3b. $x^2 - 9x \leq 36$

$x^2 - 9x - 36 \leq 0$

$(x - 12)(x + 3) \leq 0$

c.v.s $x = 12$, $x = -3$

$-3 \leq x \leq 12$

3c. $5/2 < x \leq 12$

4a. $y = \frac{1}{x} + 1$

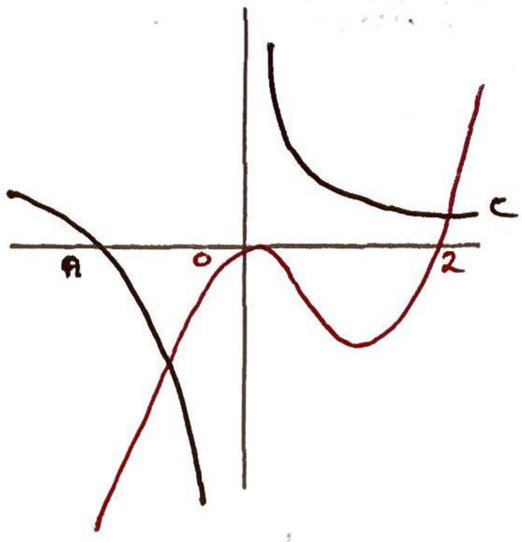
at A, $y = 0 \Rightarrow$ $0 = \frac{1}{x} + 1$ $\times x$

$0 = 1 + x$ $x = -1$ $\therefore (-1, 0)$

4b. $y = x^2(x - 2)$, $+x^3$ $\therefore$  shape

root at $x = 2$

double root at $x = 0$



4c. Two intersections $\Rightarrow$ two real solutions

5a. $a_{n+1} = 5a_n - 3$ $\quad a_2 = 7$

$a_2 = 5a_1 - 3$

$7 = 5a_1 - 3$

$10 = 5a_1 \Rightarrow a_1 = 2$

5b. $\sum_{r=1}^{4} a_r = a_1 + a_2 + a_3 + a_4$

$a_3 = 5a_2 - 3$

$a_3 = 5(7) - 3$

$= 32$

$a_4 = 5a_3 - 3$

$= 5(32) - 3$

$= 157$

$2 + 7 + 32 + 157 = 198$

6a. $\sqrt{80} = \sqrt{16 \times 5} = 4\sqrt{5}$

6b. $w \times (1+\sqrt{5}) = \sqrt{80}$

$w = \dfrac{4\sqrt{5}}{1+\sqrt{5}} \times (1-\sqrt{5})$

$\dfrac{4\sqrt{5}(1-\sqrt{5})}{(1+\sqrt{5})(1-\sqrt{5})} = \dfrac{4\sqrt{5} - 20}{1-5} = \dfrac{4\sqrt{5} - 20}{-4} = 5 - \sqrt{5}$

7a. $(1-2x)^2 = 1 - 4x + 4x^2$

$\dfrac{d}{dx}(1 - 4x + 4x^2) = -4 + 8x$

7b. $\dfrac{x^5 + 6\sqrt{x}}{2x^2} = \dfrac{x^5 + 6x^{1/2}}{2x^2} = \dfrac{x^3}{2} + 3x^{-3/2}$

$\dfrac{d}{dx}\left(\dfrac{x^3}{2} + 3x^{-3/2}\right) = \dfrac{3x^2}{2} + 3(-3/2)\,x^{-5/2}$

$= \dfrac{3}{2}x^2 - \dfrac{9}{2}x^{-5/2}$

8a. AP $a = 150$, $d = 10$

in 2007 $n = 8$:

Year	1	2	3	...	8
	2000	2001	2002	...	2007

$u_8 = a + (8-1)d$

$= 150 + 70$

$= 220$

8b. $S_{14} = \dfrac{14}{2}\left(2a + (14-1)d\right)$

$= 7(300 + 130)$

$= 7 \times 430$

$= 3010$

8c. Sales form an AP : $U_n = a + (n-1)d$

$a = 150 \quad d = 10$

$U_n = 150 + 10(n-1)$

Selling price form an AP : $W_n = a + (n-1)d$

$a = 900 \ , \ d = -20$

$W_n = 900 - 20(n-1)$

Selling price $= 3 \times$ Sales

$\therefore \quad W_n = 3U_n$ for some n

$900 - 20(n-1) = 3(150 + 10(n-1))$

$900 - 20n + 20 = 450 + 30n - 30$

$500 = 50n$

$n = 10$

$\therefore$ Year is 2009

9a. l_1: $2x + 3y = 26$

$3y = 26 - 2x$

$y = \frac{26}{3} - \frac{2}{3}x \quad \therefore \quad m$ of $l_1 = -\frac{2}{3}$

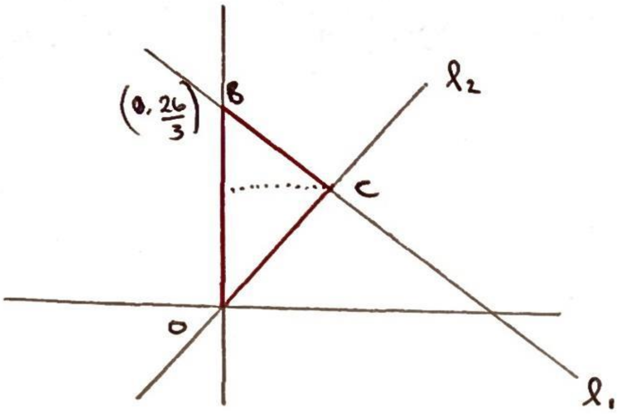
$\therefore \quad m$ of $l_2 = \frac{3}{2}$ (since $\perp$)

l_2 goes through O $\therefore \quad y - 0 = \frac{3}{2}(x - 0)$

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

9b. at B $x = 0$ $\quad 2(0) + 3y = 26$; $\quad y = \frac{26}{3}$

so B $(0, \frac{26}{3})$



to find 'height of Δ' need x coord. of C

sub $y = \frac{3}{2}x$ into l_1

$$2x + 3\left(\frac{3}{2}x\right) = 26$$

$$2x + \frac{9}{2}x = 26 \qquad \times 2$$

$$13x = 52$$

$$x = 4$$

$\therefore$ Area of Δ OBC $= \frac{1}{2}\left(\frac{26}{3} \times 4\right)$

$$= \frac{52}{3}$$

10a. $f'(x) = \frac{3}{8}x^2 - 10x^{-1/2} + 1$

$$f(x) = \int f'(x)\,dx = \int \frac{3}{8}x^2 - 10x^{-1/2} + 1 \; dx$$

$$= \frac{\left(\frac{3}{8}\right)}{3}x^3 - \frac{10x^{1/2}}{(1/2)} + x + c$$

$$= \frac{1}{8}x^3 - 20x^{1/2} + x + c$$

when $x = 4$, $f(x) = 25$; $\quad 25 = \frac{1}{8}(4)^3 - 20\sqrt{4} + 4 + c$

$$25 = \frac{1}{8}(64) - 20(2) + 4 + c$$

$$25 = 8 - 40 + 4 + c$$

$$53 = c$$

$$f(x) = \frac{1}{8}x^3 - 20x^{1/2} + x + 53$$

10b. when $x = 4$, $f'(x) = \frac{3}{8}(4)^2 - \frac{10}{\sqrt{4}} + 1$

$= 6 - 5 + 1$

$= 2$

$\therefore$ m of normal $= -\frac{1}{2}$ (Since $\perp$)

$y - 25 = -\frac{1}{2}(x - 4)$ $\times 2$

$2y - 50 = -x + 4$

$x + 2y - 54 = 0$

11a $f(x) = 2x^2 + 8x + 3$

$b^2 - 4ac$: $8^2 - 4(2)(3)$

$= 64 - 24$

$= 40$

11b. $2\left(x^2 + 4x + 3/2\right)$

$2\left((x+2)^2 - 4 + 3/2\right)$

$2\left((x+2)^2 - 5/2\right)$

$2(x+2)^2 - 5$; $p = 2$ $q = 2$ $r = -5$

11c. $y = 4x + c$, $y = 2x^2 + 8x + 3$

$4x + c = 2x^2 + 8x + 3$ (Equate to find point of intersection)

$2x^2 + 4x + (3 - c) = 0$

Since tangential, 1 point of intersection $\therefore$ $b^2 - 4ac = 0$

$4^2 - 4(2)(3-c) = 0$

$16 - 8(3-c) = 0$

$16 - 24 + 8c = 0$

$8c = 8$ $\Rightarrow$ $c = 1$