Edexcel

A Level

A Level Maths

Edexcel Core Maths C1 June 2013 Model Solutions

Name:

MME
Mathsmadeeasy.co.uk

Total Marks:

Edexcel June 13 C1

1. $\dfrac{7+\sqrt{5}}{\sqrt{5}-1} \times (\sqrt{5}+1)$

$$\frac{(7+\sqrt{5})(\sqrt{5}+1)}{(\sqrt{5}-1)(\sqrt{5}+1)} = \frac{7\sqrt{5}+7+5+\sqrt{5}}{5-1} = \frac{8\sqrt{5}+12}{4} = 2\sqrt{5}+3$$

2. $\int 10x^4 - 4x - 3x^{-1/2} \, dx$

$$= \frac{10}{5}x^5 - \frac{4}{2}x^2 - \frac{3}{(1/2)}x^{1/2} + c$$

$$= 2x^5 - 2x^2 - 6x^{1/2} + c$$

3a. $8^{5/3} = (8^{1/3})^5 = (\sqrt[3]{8})^5 = 2^5 = 32$

3b. $\dfrac{(2x^{1/2})^3}{4x^2} = \dfrac{2^3 . x^{3/2}}{4x^2} = \dfrac{8x^{3/2}}{4x^2} = 2x^{-1/2} = \dfrac{2}{\sqrt{x}}$

4a. $a_{n+1} = k(a_n+2)$, $a_1 = 4$

$$a_2 = k(a_1+2)$$
$$= k(4+2)$$
$$= 6k$$

4b. $\sum_{i=1}^{3} a_i = 2 \iff a_1 + a_2 + a_3 = 2$

$$a_3 = k(a_2+2)$$
$$= k(6k+2)$$
$$= 6k^2 + 2k$$

$$4 + 6k + 6k^2 + 2k = 2$$
$$6k^2 + 8k + 2 = 0$$
$$3k^2 + 4k + 1 = 0$$
$$(3k+1)(k+1) = 0 \quad \therefore \quad k = -1 \text{ or } -1/3$$

5a. $6x + 8 > 1 - x$

$7x > -7$

$x > -1$

5b. $3x^2 + 8x - 3 < 0$

$(3x - 1)(x + 3) < 0$

c.v.s $x = -3$ $x = 1/3$

$-3 < x < 1/3$

6a. $(-1, 3)$ $(11, 12)$

$m = \frac{y_1 - y_2}{x_1 - x_2}$; $\frac{3-12}{-1-11} = \frac{-9}{-12} = \frac{3}{4}$

$y - 3 = \frac{3}{4}(x - -1)$ $\times 4$

$4y - 12 = 3x + 3$

$3x - 4y + 15 = 0$

6b. $3x - 4y + 15 = 0$ $\times 3$

$3y + 4x - 30 = 0$ $\times 4$

$9x - 12y + 45 = 0$ ①

$12y + 16x - 120 = 0$ ②

'① + ②'

$25x - 75 = 0$

$x = 3$

'Sub $x = 3$ into ①'

$9(3) - 12y + 45 = 0$

$12y = 27 + 45$

$12y = 72$

$y = 6$ $\therefore$ $(3, 6)$

7a. AP $a = 200$ $d = 20$

$u_n = 600$, $u_n = a + (n-1)d$

$600 = 200 + (n-1)20$

$400 = (n-1)20$

$20 = n-1$

$n = 21$

7b. First 21 weeks : $S_{21} = \frac{21}{2}\left(2a + 20d\right)$

$= \frac{21}{2}\left(800\right)$

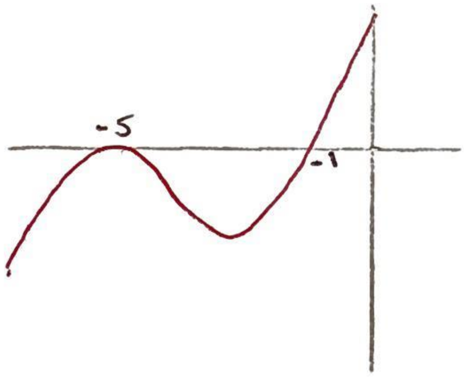
$= 21 \times 400$

$= 8400$

Then 31 weeks producing 600 $\Rightarrow$ $31 \times 600 = 18,600$

Total : $18,600 + 8,400 = 27,000$

8a. $f(x) \to f(x+2)$ translation 2 left



8b. $f(x+2) = (x+2+3)^2(x+2-1)$

$= (x+5)^2(x+1)$

8c. when $x = 0$, $y = (0+5)^2 + (0+1)$

$= 25$

9a. $f'(x) = \frac{(3-x^2)^2}{x^2}$

$= \frac{9-6x^2+x^4}{x^2}$

$= 9x^{-2} - 6 + x^2$

9b. $f''(x) = -18x^{-3} + 2x$

9c. $f(x) = \int f'(x)\,dx = \int 9x^{-2} - 6 + x^2\,dx$

$= -9x^{-1} - 6x + \frac{1}{3}x^3 + c$

when $x = -3$, $y = 10$

$10 = -\frac{9}{-3} - 6(-3) + \frac{1}{3}(-3)^3 + c$

$10 = 3 + 18 - 9 + c$

$10 = 12 + c \Rightarrow c = -2$

$f(x) = -9x^{-1} - 6x + \frac{1}{3}x^3 - 2$

10a. $2x + y = 1 \Rightarrow y = 1 - 2x$ ①

$x^2 - 4ky + 5k = 0$ ②

'Sub ① into ②'

$x^2 - 4k(1-2x) + 5k = 0$

$x^2 - 4k + 8kx + 5k = 0$

$x^2 + 8kx + k = 0$

10b. equal roots $\Rightarrow b^2 - 4ac = 0$

$(8k)^2 - 4(1)(k) = 0$

$64k^2 - 4k = 0$

$4k(16k - 1) = 0$

$k = 0$ or $1/16$, since $k \neq 0$, $k = \frac{1}{16}$

10c. $k = \frac{1}{16}$, $x^2 + 8kx + k = 0$

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

$\left(x + \frac{1}{4}\right)^2 = 0$

$x = -1/4$

'sub in ①' $y = 1 - 2(-1/4)$

$= 1 + 1/2$

$= 3/2$

$\therefore \quad x = -1/4, \quad y = 3/2$

11a. when $y = 0$; $0 = \frac{3}{x} + 4 \quad \times x$

$0 = 3 + 4x$

$x = -3/4$ so $(-3/4, 0)$

11b. $x = 0$ and $y = 4$

11c. $y = 3x^{-1} + 4$

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

when $x = -3$, $\frac{dy}{dx} = \frac{-3}{(-3)^2} = -\frac{1}{3}$

$\therefore$ m of normal $= 3$ (since $\perp$)

$y - 3 = 3(x - -3)$

$y - 3 = 3x + 9$

$y = 3x + 12$

11d. $x = 0 \quad y = 12$ so B $(0, 12)$

when $y = 0 \quad 0 = 3x + 12$

$x = -4$ so A $(-4, 0)$

$$|AB| = \sqrt{(0--4)^2 + (12-0)^2}$$

$$= \sqrt{16+144}$$

$$= \sqrt{160}$$

$$= \sqrt{16 \times 10}$$

$$= 4\sqrt{10}$$