Edexcel

A Level

A Level Maths

Edexcel Core Maths C1 June 2012 Model Solutions

Name:

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Total Marks:

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Edexcel June 12 C1

1. $\int 6x^2 + \frac{2}{x^2} + 5 \quad dx$

$= \int 6x^2 + 2x^{-2} + 5 \quad dx$

$= 2x^3 - 2x^{-1} + 5x + c$

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

2b. $\left(\frac{25x^4}{4}\right)^{-1/2}$

$\left(\frac{4}{25x^4}\right)^{1/2} = \frac{\sqrt{4}}{\sqrt{25x^4}} = \frac{2}{5x^2}$

3. $\frac{2}{\sqrt{12} - \sqrt{8}} \times (\sqrt{12} + \sqrt{8})$

$\frac{2(\sqrt{12} + \sqrt{8})}{(\sqrt{12} - \sqrt{8})(\sqrt{12} + \sqrt{8})} = \frac{2\sqrt{12} + 2\sqrt{8}}{12 - 8}$

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

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

4a. $y = 5x^3 - 6x^{4/3} + 2x - 3$

$\frac{dy}{dx} = 15x^2 - \frac{24}{3}x^{1/3} + 2$

$= 15x^2 - 8x^{1/3} + 2$

4b. $\frac{d^2y}{dx^2} = 30x - \frac{8}{3}x^{-2/3}$

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5a. $a_{n+1} = 2a_n - c \quad , \quad a_1 = 3$

$a_2 = 2a_1 - c$

$= 2(3) - c$

$= 6 - c$

5b. $a_3 = 2a_2 - c$

$= 2(6-c) - c$

$= 12 - 3c$

5c. $\sum_{i=1}^{4} a_i \geq 23 \iff a_1 + a_2 + a_3 + a_4 \geq 23$

$a_4 = 2a_3 - c$

$= 2(12-3c) - c$

$= 24 - 7c$

$\therefore \quad 3 + 6 - c + 12 - 3c + 24 - 7c \geq 23$

$45 - 11c \geq 23$

$22 \geq 11c$

$2 \geq c$

6a. AP : $a = 10 \quad d = 5$

$u_{15} = a + 14d$

$= 10 + 14(5)$

$= 80$

6b. $S_{60} = \frac{1}{2}(60)\left(2(10) + (60-1)5\right)$

$= 30(20 + 295)$

$= 30(315)$

$= 9450$

$= £94.50$

6c. AP. $a = 10$ $d = 10$

$$S_m = 6300 = \frac{m}{2}\left\{2(10) + (m-1)10\right\}$$

$$6300 = \frac{m}{2}\left\{20 + 10m - 10\right\}$$

$$= \frac{m}{2} \cdot 10(m+1)$$

$$6300 = 5m(m+1)$$

$$1260 = m(m+1)$$

$$35 \times 36 = m(m+1)$$

6d. $m = 35$

7a. $f'(x) = \frac{1}{2}x - \frac{6}{\sqrt{x}} + 3$

at P, $f'(x) = \frac{1}{2}(4) - \frac{6}{\sqrt{4}} + 3$

$$= 2 - 3 + 3$$

$$= 2$$

$\therefore$ grad of tan. $= 2$

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

$$y + 1 = 2x - 8$$

$$y = 2x - 9$$

7b. $f(x) = \int f'(x)\,dx = \int \frac{1}{2}x - 6x^{-1/2} + 3\,dx$

$$= \frac{1}{4}x^2 - 12x^{1/2} + 3x + c$$

$f(4) = -1 \Rightarrow \frac{1}{4}(4)^2 - 12(4)^{1/2} + 3(4) + c = -1$

$$4 - 24 + 12 + c = -1$$

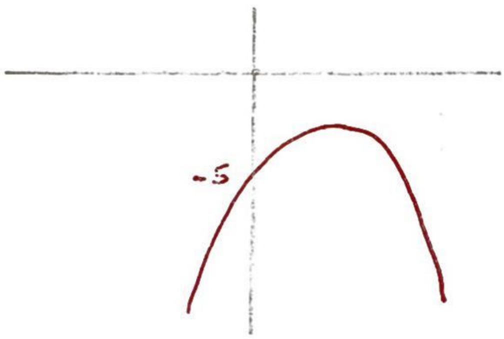
$$c = 7$$

$\therefore f(x) = \frac{1}{4}x^2 - 12x^{1/2} + 3x + 7$

8a.
$$4x - 5 - x^2 \equiv q - (x+p)^2$$
$$-\{x^2 - 4x + 5\}$$
$$-\{(x-2)^2 - 4 + 5\}$$
$$-\{(x-2)^2 + 1\}$$
$$-1 - (x-2)^2 \equiv q - (x+p)^2$$

8b.
$$b^2 - 4ac \; : \; 4^2 - 4(-1)(-5)$$
$$16 - 20$$
$$= -4$$

8c.
when $x = 0$ $\quad y = 4(0) - 5 - 0^2$
$$= -5$$



9a.
$L_1 \; : \; 4y + 3 = 2x$

when $x = p$, $y = 4$ $\Rightarrow$ $4(4) + 3 = 2p$
$$19 = 2p \Rightarrow p = 19/2$$

9b.
m of L_1 : $4y = 2x - 3$
$$y = \tfrac{1}{2}x - \tfrac{3}{4} \Rightarrow m = 1/2$$

$\therefore$ m of L_2 : -2 (since $\perp$)

$$y - 4 = -2(x-2)$$
$$y - 4 = -2x + 4$$
$$2x + y - 8 = 0$$

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9c. $y = \frac{1}{2}x - \frac{3}{4}$ ①

$y = 8 - 2x$ ②

'Equate ① and ②'

$\frac{1}{2}x - \frac{3}{4} = 8 - 2x \quad \times 4$

$2x - 3 = 32 - 8x$

$10x = 35$

$x = 7/2$

$y = 8 - 2(7/2)$

$= 8 - 7$

$= 1$

$\therefore$ intersect at $(7/2, 1)$

9d. $|CD| = \sqrt{(7/2 - 2)^2 + (1-4)^2}$

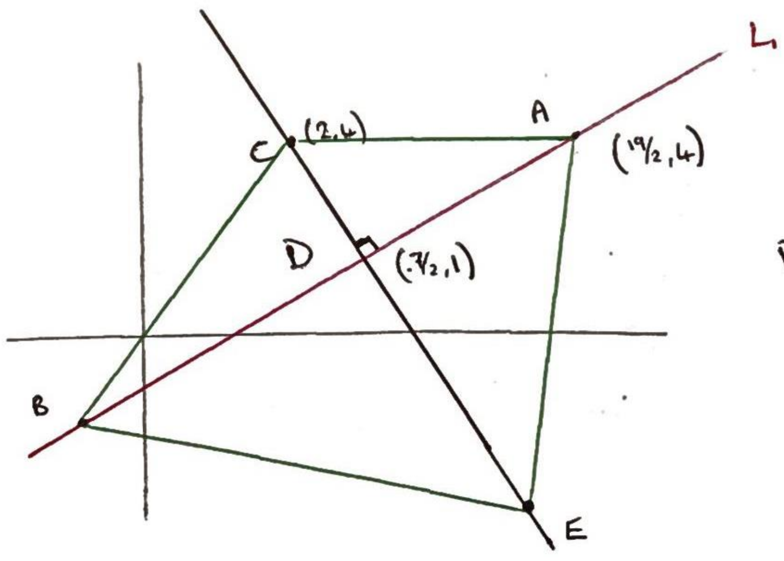
$|CD|^2 = \left(\frac{3}{2}\right)^2 + 9$

$|CD|^2 = \frac{9}{4} + 9$

$CD = \sqrt{\frac{9}{4}(1+4)}$

$= \frac{3}{2}\sqrt{5}$

9e. $AB = \sqrt{80} = \sqrt{16 \times 5} = 4\sqrt{5}$



$DE = 3\sqrt{5}$

9e. Δ ABC $= \frac{1}{2}(b \times h)$

$= \frac{1}{2}\left(4\sqrt{5} \times \frac{3}{2}\sqrt{5}\right)$

$= \frac{1}{2}(6 \times 5)$

$= 15$

Δ ABE $= \frac{1}{2}\left(4\sqrt{5} \times 3\sqrt{5}\right)$

$= \frac{1}{2}(12 \times 5)$

$= 30$

$\therefore$ area of quad. ACBE $= 15 + 30$

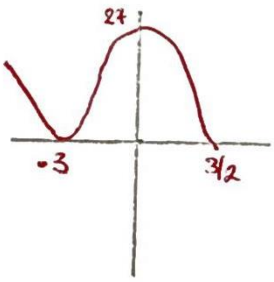
$= 45$

10a. $f(x) = x^2(9-2x)$

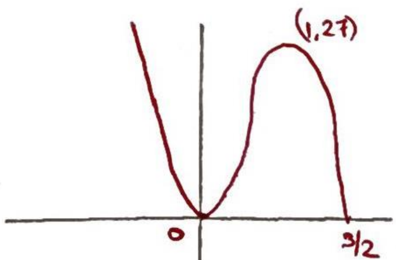
A when $9-2x = 0$ $x = 9/2$

A $(9/2, 0)$

10bi. $f(x) \rightarrow f(x+3)$ translation 3 left



10bii. $f(x) \rightarrow f(3x)$ stretch s.f. $1/3$ in x direction



10c. $f(x) \rightarrow f(x) + k$ translation k up

max. has gone from $(3,27)$ to $(3,10)$ $\therefore$ down 17

$\Rightarrow k = -17$