Visit http://www.mathsmadeeasy.co.uk/ for more fantastic resources.

Edexcel

A Level

A Level Maths

Edexcel Core Maths C2 January 2011 Model Solutions

Name:

M M E

Mathsmadeeasy.co.uk

Total Marks:

Maths Made Easy © Complete Tuition Ltd 2017

Edexcel Jan 11 C2

1a. $f(x) = x^4 + x^3 + 2x^2 + ax + b$

$f(1) = 7$

$7 = 1^4 + 1^3 + 2(1)^2 + a(1) + b$

$7 = 1 + 1 + 2 + a + b$

$a + b = 3$ ①

1b. $f(-2) = -8$

$-8 = (-2)^4 + (-2)^3 + 2(-2)^2 + a(-2) + b$

$-8 = 16 - 8 + 8 - 2a + b$

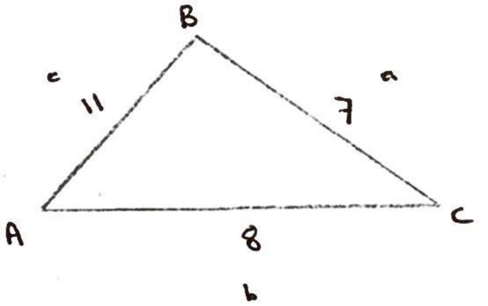
$-24 = -2a + b$ ②

'① - ②'

$27 = 3a \Rightarrow a = 9$

'sub in ①' $9 + b = 3 \Rightarrow b = -6$

2a.



$c^2 = a^2 + b^2 - 2bc\cos C$

$$\cos C = \frac{a^2 + b^2 - c^2}{2bc}$$

$$= \frac{7^2 + 8^2 - 11^2}{2(7)(8)}$$

$$= -\tfrac{1}{4}$$

$c = \cos^{-1}(-1/4) = 1.64228\ldots$

$= 1.64^c$ (3sf)

2b.

$$\text{Area} = \frac{1}{2}ab\sin C$$

$$= \frac{1}{2}(8)(7)\sin(1.64\ldots)$$

$$= 27.928\ldots$$

$$= 27.9 \quad (3sf)$$

3a.

$$u_n = ar^{n-1}$$

$$u_2 = 750 = ar \quad ①$$

$$u_5 = -6 = ar^4 \quad ②$$

'① ÷ ②'

$$\frac{ar}{ar^4} = \frac{750}{-6}$$

$$\frac{1}{r^3} = -125$$

$$r^3 = -\frac{1}{125} \quad \Rightarrow \quad r = -1/5$$

3b.

sub $r = -1/5$ into ①

$$750 = a(-1/5)$$

$$a = 750 \div (-1/5)$$

$$= -3750$$

3c.

$$S_\infty = \frac{-3750}{1 - -1/5}$$

$$= -3125$$

Maths Made Easy © Complete Tuition Ltd 2017

4a. $y = (x+1)(x-5)$

$A\ (-1,0) \quad B\ (5,0)$

4b. $y = x^2 - 4x - 5$

$$R = \int_{-1}^{5} x^2 - 4x - 5 \ dx$$

$$= \left[\tfrac{1}{3}x^3 - 2x^2 - 5x \right]_{-1}^{5}$$

$$= \left(\tfrac{1}{3}(5)^3 - 2(5)^2 - 5(5) \right) - \left(\tfrac{1}{3}(-1)^3 - 2(-1)^2 - 5(-1) \right)$$

$$= -36$$

$\therefore \quad R = 36$ (neg. because below x axis)

5a. $\binom{40}{4} = \dfrac{40!}{4!\,b!} \qquad \binom{n}{r} = \dfrac{n!}{r!(n-1)!} \qquad \therefore \quad b = 36$

5b. $$(1+x)^{40} = 1 + \dots + {}^{40}C_4\, 1^{36} x^4 + {}^{40}C_5\, 1^{35} x^5 + \dots$$

$$= 1 + \dots + 91390x^4 + 658{,}008x^5 + \dots$$

$$\frac{q}{p} = \frac{658{,}008}{91390} = \frac{36}{5}$$

6a. $x = 2.5 \qquad y = 0.30$

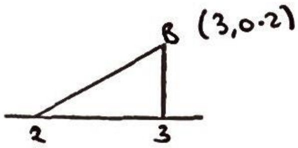
$x = 2.75 \qquad y = 0.24$

6b. $$\int \approx \tfrac{1}{2}(0.25)\left\{(0.5 + 0.2) + 2(0.38 + 0.3 + 0.24)\right\}$$

$$= 0.3175$$

Maths Made Easy © Complete Tuition Ltd 2017

6c. At B, $x = 3$ $\quad y \approx 0.2$



$A \text{ of } \Delta = \frac{1}{2}(1 \times 0.2)$

$= 0.1$

$\therefore \quad S \approx 0.3175 - 0.1$

$= 0.2175$

7a. $3\sin^2 x + 7\sin x = \cos^2 x - 4$

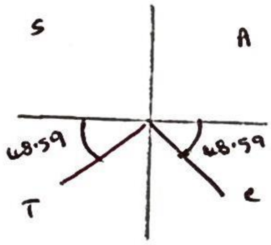
$3\sin^2 x + 7\sin x = (1 - \sin^2 x) - 4$

$4\sin^2 x + 7\sin x + 3 = 0$

7b. $(4\sin x + 3)(\sin x + 1) = 0$ $\qquad 0 \leq x < 360$

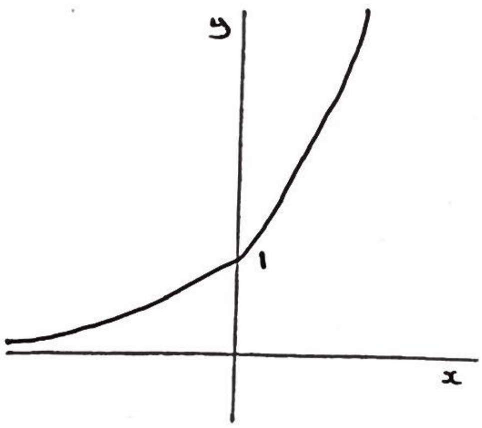
$\sin x = -3/4$ $\qquad$ or $\qquad \sin x = -1$

P.V. $x = -48.59$ $\qquad$ P.V. $x = -90$



$x = 228.6,\ 311.4$ $\qquad x = 270°$

8a. $y = 7^x$



Maths Made Easy © Complete Tuition Ltd 2017

8b. $7^{2x} - 4(7^x) + 3 = 0$ let $y = 7^x$

$y^2 = 7^{2x}$

$y^2 - 4y + 3 = 0$

$(y-3)(y-1) = 0$

$y = 3$ or $y = 1$

$7^x = 3$ $7^x = 1$

$x \log 7 = \log 3$ $x = 0$

$x = \dfrac{\log 3}{\log 7}$

$= 0.56$ (2dp)

9a. $A(-2,11)$ $B(8,1)$

AB = dimater $\therefore$ C = midpoint of AB

C; $\left(\dfrac{-2+8}{2}, \dfrac{11+1}{2}\right) = (3,6)$

9b. Radius $= \frac{1}{2}|AB|$ (radius $= \frac{1}{2}$ diameter)

$= \frac{1}{2} \cdot \sqrt{(-2-8)^2 + (11-1)^2}$

$= 5\sqrt{2}$

C $(x-3)^2 + (y-6)^2 = (5\sqrt{2})^2$

$(x-3)^2 + (y-6)^2 = 50$

9c. $x = 10$, $y = 7$

$(10-3)^2 + (7-6)^2 = 50$

$7^2 + 1^2 = 50$

$49 + 1 = 50$ $\therefore$ $(10,7)$ lies on C

9d. grad of radius (C to 10,7)

$$\frac{7-6}{10-3} = \frac{1}{7}$$

$\therefore$ m of tangent $= -7$ (since $\perp$)

$$y - 7 = -7(x-10)$$
$$y - 7 = -7x + 70$$
$$y = 77 - 7x$$

10a. $V = 4x(5-x)^2$

$$= 4x(25 - 10x + x^2)$$
$$= 100x - 40x^2 + 4x^3$$

$$\frac{dV}{dx} = 100 - 80x + 12x^2$$

10b. max. when $\frac{dV}{dx} = 0$

$$12x^2 - 80x + 100 = 0 \qquad (\div 4)$$
$$3x^2 - 20x + 25 = 0$$
$$(3x-5)(x-5) = 0$$

$x = 5$ or $5/3$ since $0 < x < 5$, $x = 5/3$

when $x = 5/3$, $V = 4(5/3)(5 - 5/3)^2$

$$= \frac{2000}{27}$$

10c. $\frac{d^2V}{dx^2} = -80 + 24x$

when $x = 5/3$, $\frac{d^2V}{dx^2} = -80 + 24(5/3)$

$$= -40$$

$\frac{d^2V}{dx^2} < 0$ $\therefore$ maximum

Maths Made Easy © Complete Tuition Ltd 2017