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

Edexcel

A Level

A Level Maths

Edexcel Core Maths C2 June 2014 Model Solutions

Name:

MME
Mathsmadeeasy.co.uk

Total Marks:

Edexcel June 14 C2

1a. $x = 1.25$, $y = 1.601$

1b. $R \approx \frac{1}{2}(0.25)\left\{(1.414 + 2.236) + 2(1.601 + 1.803 + 2.016)\right\}$

≈ 1.81 (2dp)

2a. $f(x) = 2x^3 - 7x^2 + 4x + 4$

$f(2) = 2(2)^3 - 7(2)^2 + 4(2) + 4$

$= 16 - 28 + 8 + 4$

$= 0$ $\therefore$ $(x-2)$ is a factor

2b.

$$\begin{array}{r|l} & 2x^2 - 3x - 2 \\ \hline x-2 & 2x^3 - 7x^2 + 4x + 4 \\ & \underline{2x^3 - 4x^2} \\ & \quad -3x^2 + 4x \\ & \quad \underline{-3x^2 + 6x} \\ & \qquad -2x + 4 \\ & \qquad \underline{-2x + 4} \\ & \qquad\quad 0 \end{array}$$

$\therefore$ $f(x) = (x-2)(2x^2 - 3x - 2)$

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

3a. $(2-3x)^6 = {}^6C_0\, 2^6 + {}^6C_1\, 2^5(-3x) + {}^6C_2\, 2^4(-3x)^2 + \ldots$

$= 64 - 576x + 2160x^2 + \ldots$

3b. $\left(1 + \frac{x}{2}\right)(64 - 576x + 2160x^2 + \ldots)$

$= 64 - 576x + 2160x^2 + 32x - 288x^2 + \ldots$

$= 64 - 544x + 1872x^2$

4.
$$\int_1^{\sqrt{3}} \frac{1}{6}x^3 + \frac{1}{3}x^{-2}\, dx$$

$$= \left[\frac{1}{24}x^4 - \frac{1}{3}x^{-1} \right]_1^{\sqrt{3}}$$

$$= \left(\frac{1}{24}(\sqrt{3})^4 - \frac{1}{3}(\sqrt{3})^{-1} \right) - \left(\frac{1}{24}(1)^4 - \frac{1}{3}(1)^{-1} \right)$$

$$= \frac{6 - \sqrt{3}}{9}$$

$$= \frac{2}{3} - \frac{1}{9}\sqrt{3} \quad ; \quad a = \frac{2}{3} \quad b = -\frac{1}{9}$$

5a.
$$A = \frac{1}{2}r^2\theta = \frac{1}{2}(5)^2(1.4) = 17.5$$

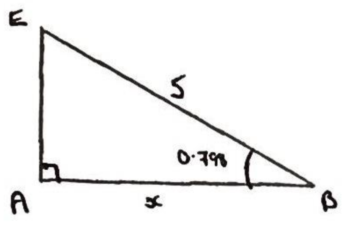
5b.
$$\cos\theta = \frac{5^2 + 7.5^2 - 6.1^2}{2(5)(7.5)} \quad \therefore \quad \theta = 0.943$$

5c.
$$\text{Area of } \triangle = \frac{1}{2}ab\sin C = \frac{1}{2}(5)(7.5)\sin 0.943$$

$$= 15.1748\ldots$$

$$E\hat{B}A = \pi - 0.943 - 1.4$$

$$= 0.79859$$



$$\frac{x}{5} = \cos(0.79859\ldots)$$

$$x = 3.4885\ldots$$

$$\therefore \text{Area} = \frac{1}{2}(5)(3.4885\ldots)\sin 0.79859$$

$$= 6.2478\ldots$$

$$\therefore \text{Total Area} = 6.2478\ldots + 17.5 + 15.1748$$

$$= 38.9 \quad (3sf)$$

6a. $S_\infty = \frac{a}{1-r} = \frac{20}{1-7/8} = 160$

6b. $S_{12} = \frac{a(1-r^{12})}{1-r} = \frac{20(1-0.875^{12})}{1-7/8}$

$= 127.7 \quad (1\text{dp})$

6c. $S_\infty - S_N < 0.5$

$160 - S_N < 0.5$

$S_N > 159.5$

$\frac{20(1-0.875^N)}{1/8} > 159.5$

$1 - 0.875^N > \frac{319}{320}$

$0.875^N < \frac{1}{320}$

$N \log(0.875) < \log(1/320)$

$N > \frac{\log(1/320)}{\log(0.875)}$ (Sign flips since $\log 0.875 < 0$)

$N > 43.198\ldots$

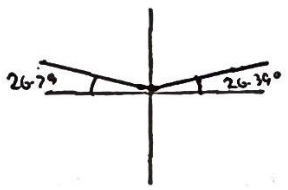
$\therefore N = 44$

7i. $9\sin(\theta + 60) = 4 \qquad 0 \le \theta < 360°$

$\sin(\theta + 60) = 4/9$

let $\phi = \theta + 60$, $\sin\phi = 4/9 \qquad 60 \le \phi < 420$

P.V. $\phi = 26.39°$



$\therefore \phi = 153.6°, \ 386.4°$

$x = 93.6°, \ 326.4°$

7ii.

$2\tan x - 3\sin x = 0 \qquad -\pi \leq x < \pi$

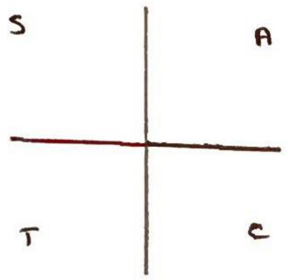
$\frac{2\sin x}{\cos x} - 3\sin x = 0$

$2\sin x - 3\sin x\cos x = 0$

$\sin x(2 - 3\cos x) = 0$

$\sin x = 0$

P.V. $x = 0$

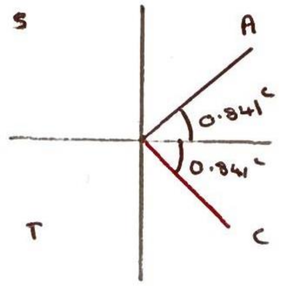


$x = 0, -\pi$

$3\cos x = 2$

$\cos x = 2/3$

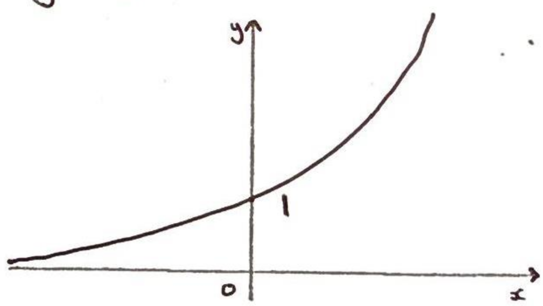
P.V. $x = 0.841$



$x = 0.84^c, -0.84^c$

8a.

$y = 3^x$



8b.

$3^{2x} - 9(3^x) + 18 = 0 \qquad$ let $y = 3^x$, $y^2 = 3^{2x}$

$y^2 - 9y + 18 = 0$

$(y-3)(y-6) = 0$

$y = 3$

$3^x = 3 \Rightarrow x = 1$

or

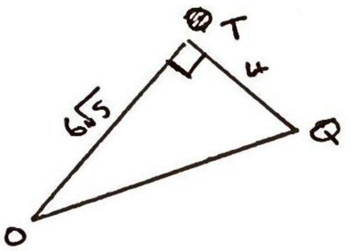
$y = 6$

$3^x = 6$

$x\log 3 = \log 6$

$x = \frac{\log 6}{\log 3} = 1.63$ (2dp)

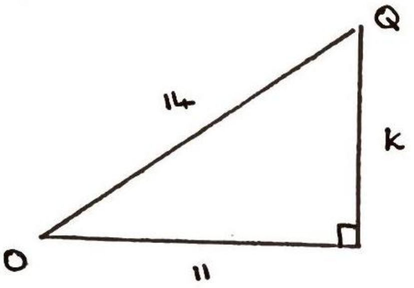
9a.



$OQ^2 = (6\sqrt{5})^2 + 4^2$

$= 196$

$\therefore \ OQ = 14$



$k^2 = 14^2 - 11^2$

$k = 5\sqrt{3}$

9b. $(x-11)^2 + (y - 5\sqrt{3})^2 = 4^2$

10a. A of trap : $\dfrac{9x + 6x}{2} \times 4x = 30x^2$

Volume $9600 = 30x^2 y$

$y = \dfrac{9600}{30x^2}$

$= \dfrac{320}{x^2}$

10b. SA $= 2(30x^2) + 6xy + 5xy + 4xy + 9xy$

$= 60x^2 + 24xy$

$= 60x^2 + 24x\left(\dfrac{320}{x^2}\right)$

$= 60x^2 + \dfrac{7680}{x}$

10c. $\dfrac{dS}{dx} = 120x - 7680x^{-2}$

minimum when $\dfrac{dS}{dx} = 0$

$$\therefore \quad \frac{7680}{x^2} = 120x$$

$$7680 = 120x^2$$

$$x^3 = 64$$

$$x = 4$$

when $x = 4$, $S = 60(4)^2 + \frac{7680}{4}$

$$= 2880$$

10d. $\frac{d^2S}{dx^2} = 120 + 15360x^{-3}$

when $x = 4$, $\frac{d^2S}{dx^2} = 120 + 15360(4)^{-3}$

$$= 360$$

$$\frac{d^2S}{dx^2} > 0$$

$\therefore$ minimum