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Edexcel

A Level

A Level Maths

Edexcel Core Maths C2 June 2010 Model Solutions

Name:

M M E

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Total Marks:

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Edexcel June 2010 C2

1a.

x	0	0.2	0.4	0.6	0.8	1
y	1	1.65	2.35	3.13	4.01	5

1b. $h = 0.2$

$$\int \approx \frac{1}{2}(0.2)\{(1+5) + 2(1.65 + 2.35 + 3.13 + 4.01)\}$$

$$= 2.828$$

2a. $f(x) = 3x^3 - 5x^2 - 58x + 40$

$f(3) = 3(3)^3 - 5(3)^2 - 58(3) + 40$

$= -98$

2b.

$$x-5 \overline{)\,3x^3 - 5x^2 - 58x + 40}$$

$3x^2 + 10x - 8$

$3x^3 - 15x^2$ ↓ ↓

$10x^2 - 58x$

$10x^2 - 50x$

$-8x + 40$

$-8x + 40$

0

$f(x) = (x-5)(3x^2+10x-8)$

$= (x-5)(3x-2)(x+4)$

∴ when $f(x) = 0$

$x = 5$, $2/3$ or -4

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3a. $y = x^2 - kx^{1/2}$

$\frac{dy}{dx} = 2x - \frac{1}{2}kx^{-1/2}$

3b. when $x = 4$, $\frac{dy}{dx} < 0$

$2(4) - \frac{1}{2}k(4)^{-1/2} < 0$

$8 - \frac{1}{4}k < 0$

$8 < \frac{1}{4}k$

$k > 32$

4a. $(1+ax)^7 = {}^7C_0\,1^7 + {}^7C_1\,1^6(ax) + {}^7C_2\,1^5(ax)^2 + {}^7C_3\,1^4(ax)^3 + \ldots$

$= 1 + 7ax + 21a^2x^2 + 35a^3x^3 + \ldots$

4b. $21a^2 = 525$

$a^2 = 25$

$a = \pm 5$

5a. $5\sin\theta = 2\cos\theta$

$5\tan\theta = 2$

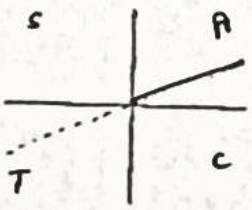
$\tan\theta = 2/5$

5b. Let $\theta = 2x$

$0 \leq \theta < 720$

$\tan\theta = 2/5$

P.V. $\theta = 21.8$



$\theta = 21.8, 201.8, 381.8, 561.8$

$\therefore$

$x = 10.9, 100.9, 190.9, 280.9$

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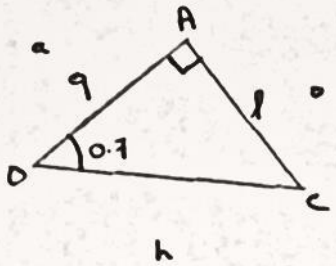
6a. $l = r\theta$; $l = 9 \times 0.7 = 6.3$

6b. $A = \frac{1}{2}r^2\theta$; $A = \frac{1}{2}(9)^2(0.7) = 28.35$

6c.



$\tan 0.7 = \frac{l}{9}$

$l = 9\tan 0.7$

$= 7.580595\ldots$

$= 7.58 \quad (2dp)$

6d. Area of $\triangle = \frac{1}{2}ab\sin C$

$= \frac{1}{2}(9)(7.58)(\sin \pi/2)$

$= \frac{3411}{100}$

$\therefore$ H. $\triangle$ - Af Sector

$= \frac{3411}{100} - 28.35$

$= 5.76 \quad (3sf)$

7a. $2\log_3(x-5) - \log_3(2x-13) = 1$

$\log_3[(x-5)^2] - \log_3(2x-13) = 1$

$\log_3\left[\frac{(x-5)^2}{2x-13}\right] = 1$

$\frac{(x-5)^2}{2x-13} = 3^1$

$(x-5)^2 = 3(2x-13)$

$x^2 - 10x + 25 = 6x - 37$

$x^2 - 16x + 64 = 0$

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7b. $(x-8)^2 = 0$

$x = 8$

8a. $y = x^3 - 10x^2 + kx$

$\frac{dy}{dx} = 3x^2 - 20x + k$

when $x = 2$, $\frac{dy}{dx} = 0$

$0 = 3(2)^2 - 20(2) + k$

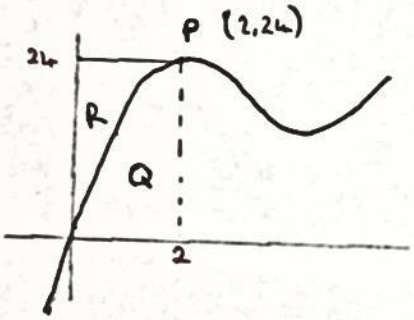
$0 = 12 - 40 + k$

$k = 28$

8b. $x = 2$, $y = (2)^3 - 10(2)^2 + 28(2)$

$= 24$

so P (2, 24)



Area of rectangle : $2 \times 24 = 48$

Area of Q : $\int_0^2 x^3 - 10x^2 + 28x \, dx$

$= \left[\frac{1}{4}x^4 - \frac{10}{3}x^3 + 14x^2 \right]_0^2$

$= \left(\frac{1}{4}(2)^4 - \frac{10}{3}(2)^3 + 14(2)^2 \right) - 0$

$= \frac{100}{3}$

$R = 48 - \frac{100}{3} = \frac{44}{3}$

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9a. $25{,}000 \times 1{\cdot}03 = 25{,}750$

9b. $r = 1{\cdot}03 \quad (a = 25{,}000)$

9c. $ar^{N-1} > 40{,}000$

$25{,}000(1{\cdot}03)^{N-1} > 40{,}000 \quad (\div 25{,}000)$

$1{\cdot}03^{N-1} > 1{\cdot}6$

$(N-1)\log 1{\cdot}03 > \log 1{\cdot}6$

9d. $N - 1 > \dfrac{\log 1{\cdot}6}{\log 1{\cdot}03}$

$N > 1 + 15{\cdot}9\ldots$

$N = 17$

9e. $S_{10} = \dfrac{a(1-r^{10})}{1-r}$

$= \dfrac{25{,}000(1-1{\cdot}03^{10})}{1-1{\cdot}03}$

$= 286{,}596{\cdot}9\ldots$

$= 287{,}000$

10. Length AB = radius $\quad A(2,1) \quad B(10,7)$

$|AB| = \sqrt{(10-2)^2 + (7-1)^2}$

$= 10$

C: $(x-2)^2 + (y-1)^2 = 100$

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10b. m of AB $= \frac{7-1}{10-2} = \frac{3}{4}$

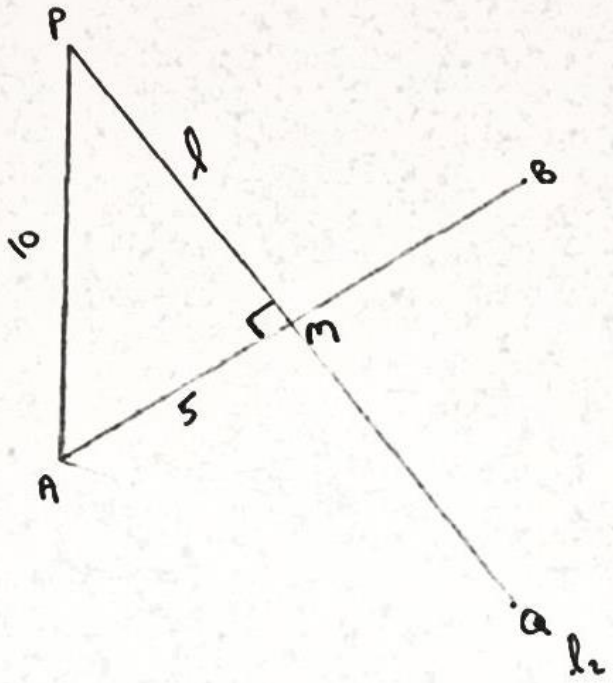
$\therefore$ m of $l_1 = -4/3$ (since $\perp$)

$y - 7 = -\frac{4}{3}(x - 10)$

$3y - 21 = -4x + 40$

$3y = 61 - 4x$

10c.



AP = 10 (radius)

AM = 5 (half radius)

Let PM = l ; $10^2 = l^2 + 5^2$

$l = 5\sqrt{3}$

$\therefore$ PQ $= 2l$

$= 10\sqrt{3}$

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