Edexcel

A Level

A Level Maths

Edexcel Core Maths C2 January 2013 Model Solutions

Name:

MME
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Total Marks:

1. $(2-5x)^6$ $2^6 + \,^6C_1 2^5(-5x) + \,^6C_2 2^4(-5x)^2$

$$= 64 - 960x + 6000x^2$$

2. $f(x) : ax^3 + bx^2 - 4x - 3 \qquad a, b \in \mathbb{R}$

$(x-1)$ if fact $\Rightarrow f(1) = 0$

$$a + b - 4 - 3 = 0$$
$$a + b = 7$$

$f(-2) = 9$

$$9 = -8a + 4b + 8 - 3$$
$$4 = -8a + 4b$$
$$1 = -2a + b$$
$$7 = a + b$$
$$6 = 3a \qquad a = 2 \qquad b = 5$$

3a. $120,000 \times 1.05^3 = 138,915$

3b. $120,000 \times 1.05^n > 200,000$

$$1.05^n > \frac{5}{3}$$

$$n \ln(1.05) > \ln\left(\frac{5}{3}\right)$$

$$n > 10.46$$

$$\Rightarrow n = 11 \qquad\qquad \frac{a(1-r^n)}{1-r}$$

so   2024 $\dfrac{120,000(1-1.05^{11})}{1-1.05}$

$\pounds$ 1704814

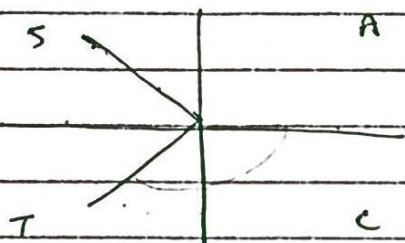4. $\cos(3x - 10) = -0.4$ $0 \leq x \leq 180$

                                $0 \leq 3x \leq 540$

P.V. $= 113.58$ $-10 \leq 3x - 10 \leq 530$

S

A

                            $3x - 10° = 113.58$

                                   246.42

T   C 473.58

                $x = 161.2°, \quad 85.5°,$

                    $41.2°$

5a. $x^2 + y^2 - 20x - 24y + 195 = 0$

$(x-10)^2 - 100 + (y-12)^2 - 144 + 195 = 0$
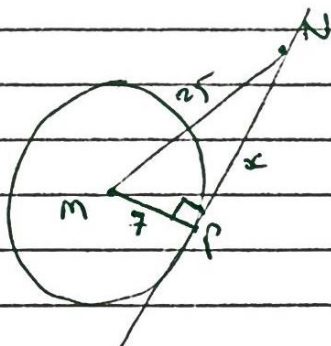
$(x-10)^2 + (y-12)^2 = 7^2 \qquad R = 7$

                                 $M = (10, 12)$

5b. $N = (25, 32)$

$|MN| = \sqrt{15^2 + 20^2} = \sqrt{625} = 25$

5c.

$25^2 = 7^2 + x^2$

$x = 24$

6a. $2\log_2(x+15) - \log_2 x = 6$

$\log_2\left[\dfrac{(x+15)^2}{x}\right] = 6$

$\dfrac{(x+15)^2}{x} = 2^6$

$(x+15)^2 = 64x$

$x^2 + 30x + 225 = 64x$

$x^2 - 34x + 225 = 0$

6b. $x = \dfrac{34 \pm \sqrt{(34)^2 - 4(1)(225)}}{2}$

$= 25 \quad \text{or} \quad 9$

7a. $9^2 = 4^2 + 6^2 - 2(4)(6)\cos\alpha$

$\cos\alpha = \qquad\qquad 2(4)(6)\cos\alpha = 4^2 + 6^2 - 9^2$

$\cos\alpha = \dfrac{4^2 + 6^2 - 9^2}{2(4)(6)}$

$= 2.2195$

$= 2.22$

7b $A = \dfrac{1}{2}r^2\theta = \dfrac{1}{2}\,2.22^2\,4^2 = $

$2\pi - (2.22)$ $32.5\,cm^2$

7c.   A of $\triangle$ $= \dfrac{1}{2}(4)(6)\sin 2.22 = 9.56$

$= 32.5$

$42.1\,cm$

7d. $\ell = r\theta \qquad \theta = 2\pi - 2.22$

$\ell = 4(2\pi - 2.22) = 16.25 + 2 + 2$

$= 27.5\,cm$

8a. $y = 6 - 3x - 4x^{-3}$

$\dfrac{dy}{dx} = -3 + 12x^{-4}$

$3x^2 = \dfrac{12}{x^4}$ $\qquad 3x^4 = 12$ 4

$\qquad\qquad\qquad\qquad x = \sqrt[4]{12}\ 4$

$\qquad\qquad\qquad\qquad = \pm\sqrt{2}$

8b. $-\sqrt{2}$

8c. $\dfrac{d^2y}{dx^2} = -48x^5$ ●

at P $x = \sqrt{2}$ $\dfrac{d^2y}{dx^2} < 0$ $\Rightarrow$ max.

$\qquad\qquad x = -\sqrt{2}$ $\dfrac{d^2y}{dx^2} > 0$ $\Rightarrow$ min.

9a. $x = 2$ $y = 6.272$ $\qquad x = 3$ $y = 3.634$

9b. $h = \dfrac{4-1}{6} = \dfrac{x}{2} = \dfrac{1}{2}$ ●

$\displaystyle\int \approx \dfrac{1}{2} \cdot \dfrac{1}{2} \left\{ (0+0) + 2\left(5.866 + 6.272 + 5.21 \right.\right.$
$\left.\left. +1.856 + 3.634\right)\right\}$

$\qquad\qquad = 11.42$

c. $\displaystyle\int_1^4 27 - 2x - 9x^{1/2} - 16x^{-2}\ dx$

$\left[27x - x^2 - 6x^{3/2} + 16x^{-1} \right]_1^4$

$F[4] = 48$

$F[1] = 36$ $\qquad\qquad \Rightarrow$ $\underline{\underline{12}}$

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