Edexcel

A Level

A Level Maths

Edexcel Core Maths C1 June 2011 Model Solutions

Name:

Mathsmadeeasy.co.uk

Total Marks:

Edexcel C1 June 2011

1a. $25^{1/2} = \sqrt{25}$

$= 5$

1b. $25^{-3/2} = \frac{1}{25^{3/2}} = \frac{1}{(\sqrt{25})^3} = \frac{1}{125}$

2a. $y = 2x^5 + 7 + \frac{1}{x^3}$

$\frac{dy}{dx} = 10x^4 - 3x^{-4}$

2b. $\int 2x^5 + 7 + \frac{1}{x^3} \, dx$

$= \frac{2}{6}x^6 + 7x + \frac{x^{-2}}{(-2)} + c$

$= \frac{1}{3}x^6 + 7x - \frac{1}{2x^2} + c$

3. P $(-1, 6)$ Q $(9, 0)$

grad of PQ $= \frac{6-0}{-1-9} = \frac{6}{-10} = -\frac{3}{5}$

Mid of PQ $= \left(\frac{-1+9}{2}, \frac{6+0}{2}\right) = (4, 3)$

L is $\perp$ $\therefore$ grad of L $= \frac{5}{3}$

$y - 3 = \frac{5}{3}(x - 4)$

$3y - 9 = 5x - 20$

$5x - 3y - 11 = 0$

4. $x + y = 2 \Rightarrow x = 2 - y$ ①

$4y^2 - x^2 = 11$ ②

Sub ① into ②

$4y^2 - (2-y)^2 = 11$

$4y^2 - (4 - 4y + y^2) = 11$

$4y^2 - 4 + 4y - y^2 = 11$

$3y^2 + 4y - 15 = 0$

$(3y - 5)(y + 3) = 0$

$y = 5/3$ or -3

when $y = 5/3$; $x = 2 - 5/3$
$= 1/3$

$y = -3$; $x = 2 - (-3)$
$= 5$

5a. $a_{n+1} = 5a_n + 3$ $\quad a_1 = k$

$a_2 = 5a_1 + 3$
$= 5k + 3$

5b. $a_3 = 5a_2 + 3$
$= 5(5k+3) + 3$
$= 25k + 18$

5ci. $\sum_{r=1}^{4} a_r = a_1 + a_2 + a_3 + a_4$

$a_4 = 5a_3 + 3$
$= 5(25k + 18) + 3$
$= 125k + 93$

$\sum_{r=1}^{4} a_r = k + 5k + 3 + 25k + 18 + 125k + 93$
$= 156k + 114$

5ci. $\sum_{r=1}^{4} a_r = 6(26k+19)$

$\therefore$ a multiple of 6

6a. $\dfrac{6x + 3x^{5/2}}{\sqrt{x}} = \dfrac{\cancel{x^{1/2}}(6x^{1/2} + 3x^2)}{\cancel{x^{1/2}}}$

$= 6x^{1/2} + 3x^2$

$\therefore p = 1/2, \quad q = 2$

6b. $\dfrac{dy}{dx} = 6x^{1/2} + 3x^2$

$y = \int 6x^{1/2} + 3x^2 \, dx$

$= \dfrac{6}{(3/2)} x^{3/2} + \dfrac{3}{3} x^3 + c$

$= 4x^{3/2} + x^3 + c$

$x = 4, \quad y = 90 \quad \therefore \quad 90 = 4(4)^{3/2} + 4^3 + c$

$90 = 32 + 64 + c$

$c = -6$

$\therefore \quad y = 4x^{3/2} + x^3 - 6$

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

$b^2 - 4ac = (k+3)^2 - 4(1)(k)$

$k^2 + 6k + 9 - 4k$

$= k^2 - 2k + 9$

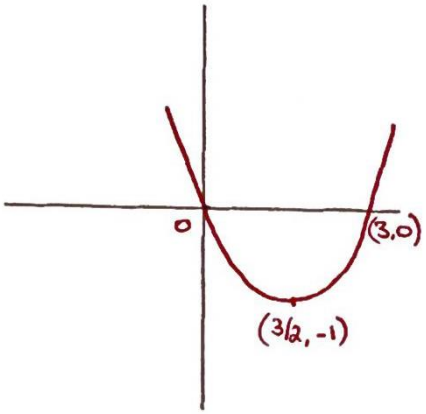
7b. $(k+1)^2 - 1 + 9$

$= (k+1)^2 + 8$

7c. $f(x)$ has real roots iff $b^2 - 4ac \geq 0$

$(k+1)^2 \geq 0 \ \forall k \implies b^2 - 4ac \geq 0 \quad \therefore f(x)$ has real roots $\forall k$

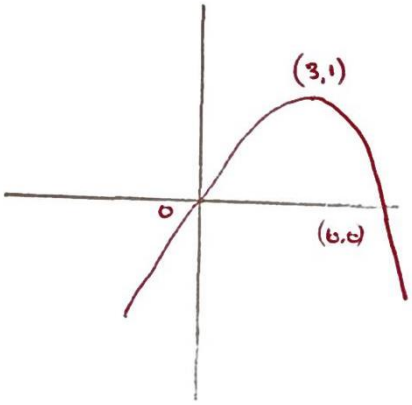
8a.



$y = f(x) \rightarrow y = f(2x)$

stretch s.f. 1/2 in x direction

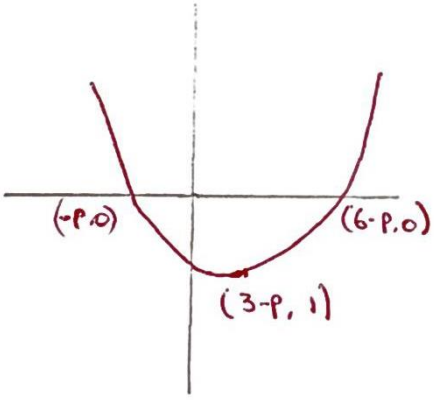
8b.



$y = f(x) \rightarrow y = -f(x)$

reflection in x axis

8c.



$y = f(x) \rightarrow y = f(x+a)$

translation left a units

9a.

$2 + 4 + 6 + \ldots + 100$

A.P. $a = 2$ $d = 2$

$S_n = \frac{1}{2}n(a + l)$

how many terms ?

$100 = 2 + (n-1)2$

$100 = 2 + 2n - 2$

$n = 50$

$S_{50} = \frac{1}{2}(50)(2 + 100)$

$= 25 \times 102$

$= 2550$

9b.i. $k + 2k + 3k + \dots + 100$

A.P. $a = k$, $d = k$

$u_n = k + (n-1)k$

$100 = k + (n-1)k$

$100 = k + nk - k$

$n = \frac{100}{k}$

9b.ii. $S_n = \frac{1}{2}n(a + l)$

$= \frac{1}{2} \cdot \frac{100}{k}(k + 100)$

$= \frac{50k}{k} + \frac{5{,}000}{k}$

$= 50 + \frac{5000}{k}$

9c. $2k+1$, $4k+4$, $6k+7$

$a = 2k+1$ $d = 2k+3$

$u_{50} = a + 49d$

$= 2k+1 + 49(2k+3)$

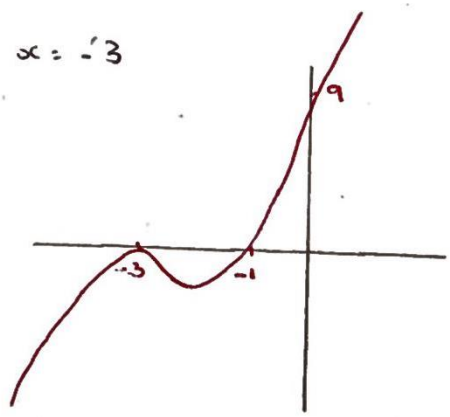
$= 2k+1 + 98k + \cancel{127}\ 147$

$= 100k + 148$

10c. $y = (x+1)(x+3)^2$ root at $x = -1$

double root at $x = -3$

when $x = 0$ $y = 1 . 3^2 = 9$



10b.

$$y = (x+1)(x+3)^2$$
$$= (x+1)(x^2+6x+9)$$
$$= x^3+6x^2+9x+x^2+6x+9$$
$$= x^3+7x^2+15x+9$$

$$\frac{dy}{dx} = 3x^2+14x+15$$

10c.

when $x = -5$ $\quad y = (-5+1)(-5+3)^2$
$$= -4(4)$$
$$= -16$$

A $(-5, -16)$

$$\frac{dy}{dx} = 3(-5)^2+14(-5)+15$$
$$= 75-70+15$$
$$= 20$$

$$y - -16 = 20(x - -5)$$
$$y+16 = 20x+100$$
$$y-20x-84 = 0$$
$$\therefore y = 20x+84$$

10d.

Parallel $\therefore$ gradients are the same

$$\Rightarrow \frac{dy}{dx} = 20$$

$$3x^2+14x+15 = 20$$
$$3x^2+14x-5 = 0$$
$$(3x-1)(x+5) = 0$$
$$x = -5 \quad \text{or} \quad x = 1/3$$

$\therefore$ at B $x = 1/3$