Edexcel

A Level

A Level Maths

Edexcel Core Maths C1 January 2010 Model Solutions

Name:

M M E

Mathsmadeeasy.co.uk

Total Marks:

Edexcel Jan 10 C1

1. $y = x^4 + x^{1/3} + 3$

$\frac{dy}{dx} = 4x^3 + \frac{1}{3}x^{-2/3}$

2a. $(7+\sqrt{5})(3-\sqrt{5}) = 21 - 7\sqrt{5} + 3\sqrt{5} - 5$

$= 16 - 4\sqrt{5}$

2b. $\frac{7+\sqrt{5}}{3+\sqrt{5}}$

$\therefore \frac{(7+\sqrt{5})(3-\sqrt{5})}{(3+\sqrt{5})(3-\sqrt{5})} = \frac{16-4\sqrt{5}}{9-5}$

$= \frac{16-4\sqrt{5}}{4}$

$= 4 - \sqrt{5}$

3a. $3x + 5y - 2 = 0$

$5y = 2 - 3x$

$y = \frac{2}{5} - \frac{3}{5}x \Rightarrow$ gradient $= -\frac{3}{5}$

3b. $l_2 \perp$ $\therefore$ grad $= \frac{5}{3}$

$y - 1 = \frac{5}{3}(x - 3)$

$y - 1 = \frac{5}{3}x - 5$

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

4. $\frac{dy}{dx} = 5x^{-1/2} + x\sqrt{x}$

$= 5x^{-1/2} + x^{3/2}$

$\therefore \quad y = \int 5x^{-1/2} + x^{3/2} \, dx$

$= \frac{5}{(1/2)} x^{1/2} + \frac{x^{5/2}}{(5/2)} + c$

$y = 10x^{1/2} + \frac{2}{5} x^{5/2} + c$

$y = 35, \quad x = 4$

$35 = 10.(4)^{1/2} + \frac{2}{5}(4)^{5/2} + c \qquad (4)^{5/2} = (4^{1/2})^5 = 2^5 = 32$

$35 = 20 + \frac{2}{5}(32) + c$

$35 = 20 + 12.8 + c$

$15 = 12.8 + c \quad \Rightarrow \quad c = 2.2$

$\therefore \quad y = 10x^{1/2} + \frac{2}{5} x^{5/2} + 2.2$

5. $y = 3x + 2 \quad ①$

$y^2 - x - 6x^2 = 0 \quad ②$

'Sub $y = 3x - 2$ into ②'

$(3x-2)^2 - x - 6x^2 = 0$

$9x^2 - 12x - x - 6x^2 + 4 = 0$

$3x^2 - 13x + 4 = 0$

$(3x-1)(x-4) = 0$

$x = 4 \quad \text{or} \quad 1/3$

$x = 4; \quad y = 3(4) - 2 = 10$

$x = 1/3; \quad y = 3(1/3) - 2 = -1$

6a. $y = \dfrac{(x+3)(x-8)}{x}$

$y = \dfrac{x^2 - 5x - 24}{x}$

$y = x - 5 - 24x^{-1}$

$\dfrac{dy}{dx} = 1 + 24x^{-2}$

6b. when $x = 2$: $y = \dfrac{(2+3)(2-8)}{2} = \dfrac{5 \times (-6)}{2} = -15$

$x = 2$; $\dfrac{dy}{dx} = 1 + \dfrac{24}{2^2} = 1 + \dfrac{24}{4} = 7$

$\Rightarrow$ $y - (-15) = 7(x-2)$

$y + 15 = 7x - 14$

$y = 7x - 29$

7a. $a = 150 \qquad d = 10$

$u_{10} = a + 9d$

$= 150 + 9(10)$

$= 240$

7b. $S_{20} = \dfrac{1}{2}n\{2a + (n-1)d\}$

$= 10\left(2(150) + 19(10)\right)$

$= 10\left(300 + 190\right)$

$= 4900$

7c. Kevin $a = A$ $d = 30$

$S_{20} = 9800$

$9800 = \frac{1}{2}(20)\{2A + (20-1)(30)\}$ $(\div 10)$

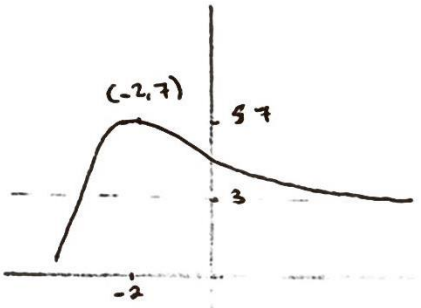
$980 = 2A + 19 \times 30$

$980 = 2A + 570$

$410 = 2A$

$A = 205$

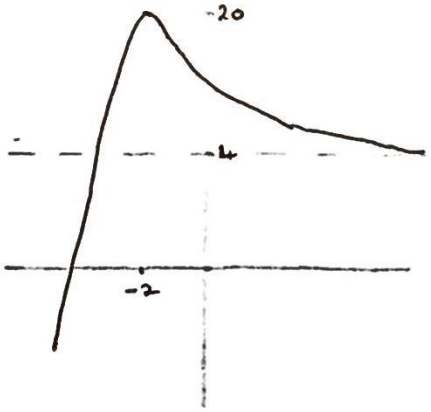
8a.



$f(x) \rightarrow f(x) + 2$

Translation 2 up

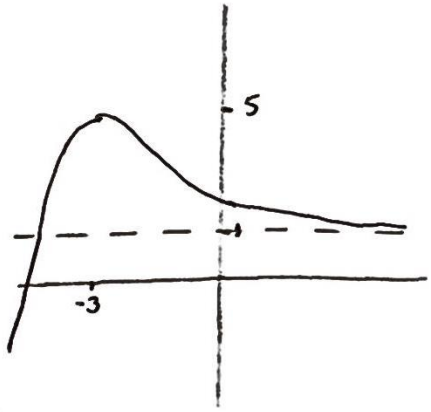
8b.



$y = f(x) \rightarrow y = 4f(x)$

stretch s.f. 4 in y direction

8c.



$f(x) \rightarrow f(x+1)$

Translation -1 in positive x direction

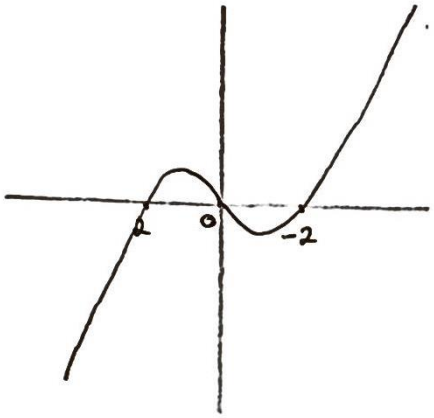
i.e. 1 unit left

9a. $x^3 - 4x$

$= x(x^2 - 4)$

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

9b.



$y = x^3 - 4x$

9c. at A, $x = -1$ $\therefore$ $y = (-1)^3 - 4(-1)$

$= 3$ A $(-1, 3)$

at B, $x = 3$ $\therefore$ $y = 3^3 - 4(3)$

$= 15$ B $(3, 15)$

grad $= \frac{y_1 - y_2}{x_1 - x_2} = \frac{15 - 3}{3 - -1} = \frac{12}{4} = 3$

$y - 15 = 3(x - 3)$

$y - 15 = 3x - 9$

$y = 3x + 6$

9d. $|AB| = \sqrt{(3 - -1)^2 + (15 - 3)^2}$

$= \sqrt{4^2 + 12^2}$

$= \sqrt{16 + 144}$

$= \sqrt{160}$

$= \sqrt{16} \times \sqrt{10}$

$= 4\sqrt{10}$

10a. $f(x) = x^2 + 4kx + (3+11k)$

$= (x-2k)^2 - 4k^2 + 3 + 11k$

10b. no real roots $\therefore b^2 - 4ac < 0$

$(4k)^2 - 4(1)(3+11k) < 0$

$16k^2 - 12 - 44k < 0$

$4k^2 - 11k - 3 < 0$

$(4k+1)(k-3) < 0$

c.v. $k = 3$ or $-1/4$

$-\frac{1}{4} < k < 3$

10c. $k = 1 \Rightarrow f(x) = x^2 + 4x + 14$

when $x = 0$, $y = 14$, since $-\frac{1}{4} < 1 < 3$ no solutions