C1 Ion 2014

1 a) $A(6,-2)$ $B(4,1)$

i) Gradient $AB = \frac{1--2}{4-6} = -\frac{3}{2}$ (m_1)

ii) $m_2 = \frac{2}{3}$

$L_1 \Rightarrow y-1 = \frac{2}{3}(x-4)$

$3(y-1) = 2x-8$

$3y-2x+5=0$

b) i) $L_2 \Rightarrow x-8y-22=0$

$x = 8y+22$

$3y-2(8y+22)+5=0$

$3y-16y-44+5=0$

$-13y-39=0$

$y=-3$

$x = 8y+22$

$= -24+22$

$= -2$

$C(-2,-3)$

ii) $\frac{x_1+x_2}{2} = \frac{6+-2}{2}$

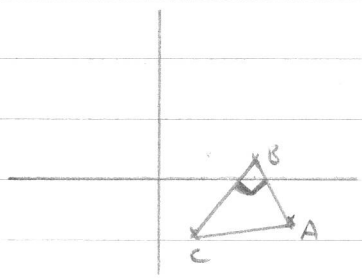
$= 2$

$\frac{y_1+y_2}{2} = \frac{-2-3}{2}$

$= \frac{-5}{2} = -2.5$

Coordinate $= (2;\frac{5}{2})$

iii)



Ar triangle $= \frac{\text{Hyd } AB \times \text{Hyd } BC}{2}$

Hyd $AB = \sqrt{(6-4)^2 + (-2-1)^2}$

$= \sqrt{4+9}$

$= \sqrt{13}$

Hyd $BC = \sqrt{(4+2)^2 + (1+3)^2}$

$= \sqrt{36+16}$

$= \sqrt{52}$

$$\text{Ar } \triangle = \frac{\sqrt{13} \times \sqrt{52}}{2} = \frac{\sqrt{13} \times \cancel{2}\sqrt{13}}{\cancel{2}} = \underline{\underline{13}}$$

2 $$\frac{3\sqrt{3} - 2\sqrt{5}}{2\sqrt{3} + \sqrt{5}} \times \frac{2\sqrt{3} - \sqrt{5}}{2\sqrt{3} - \sqrt{5}} = \frac{6\sqrt{9} - 3\sqrt{15} - 4\sqrt{15} + 2\sqrt{25}}{4\sqrt{9} - 2\sqrt{15} + 2\sqrt{15} - \sqrt{25}}$$

$$= \frac{18 - 7\sqrt{15} + 10}{12 - 5}$$

$$= \frac{28 - 7\sqrt{15}}{7}$$

$$= 4 - \sqrt{15}$$

3 $y = \frac{20}{x} + 2x^2 - 11$ $\qquad P(2,7)$

$y = 20x^{-1} + 2x^2 - 11$

$\frac{dy}{dx} = -20x^{-2} + 4x$

$= \frac{-20}{x^2} + 4x$ $\qquad$ graddient pan fo $x = 2$

$= \frac{-20}{4} + 8 = 3$ (Tangiad)

graddient Normal $= -\frac{1}{3}$

Hafaliad Normal

$$y - y_1 = m(x - x_1)$$
$$y - 7 = -\frac{1}{3}(x - 2)$$
$$3(y - 7) = -x + 2$$
$$3y - 21 = -x + 2$$
$$3y + x - 23 = 0$$

4 $x^2 + 1.6x - 24.36$

$(x + 0.8)^2 - 24.36 - 0.64$ $\qquad (x - 0.8)^2 = x^2 + 1.6x \underbrace{+ 0.64}_{-}$

$(x + 0.8)^2 - 25$

$$x^2 + 1.6x - 24.36 = 0$$
$$(x + 0.8)^2 - 25 = 0$$
$$(x + 0.8)^2 = 25$$
$$x + 0.8 = \pm 5$$
$$x = +5 - 0.8 \quad \text{neu} \quad -5 - 0.8$$
$$= 4.2 \quad \text{neu} \quad -5.8$$

5. a) $(1 + \sqrt{6})^5 = (1)^5 + 5(1)^4\sqrt{6} + 10(1)^3(\sqrt{6})^2 + 10(1)^2\sqrt{6}^3$
$+ 5(1)\sqrt{6}^4 + \sqrt{6}^5$
$= 1 + 5\sqrt{6} + 60 + 60\sqrt{6} + 180 + 36\sqrt{6}$
$= 241 + 101\sqrt{6}$

b) $(1 + 3x)^n = 1 + n(3x) + \frac{n(n-1)}{2}(3x)^2$

$\therefore \frac{n(n-1)}{2} \times 9x^2 \Rightarrow \frac{9n^2 - 9n}{2} = 495$

$$9n^2 - 9n = 990 \quad \div 9$$
$$n^2 - n - 110 = 0$$
$$(n - 11)(n + 10) = 0$$
$$\underline{\underline{n = 11}} \quad \text{neu} \quad n = -10$$

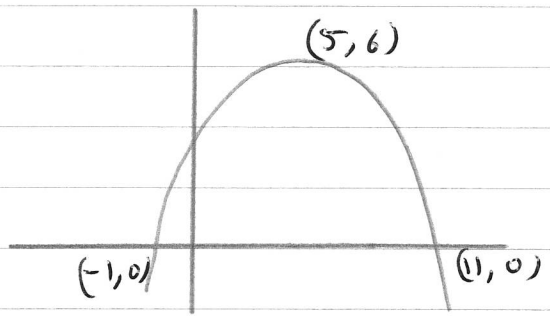
6 $(2k-3)x^2 + 8x + 2k+3 = 0$

$a = 2k-3$
$b = 8$
$c = +2k+3$

$b^2 - 4ac < 0$
$8^2 - 4(2k-3)(2k+3) < 0$
$64 - 4(4k^2-9) < 0$
$64 - 16k^2 + 36 < 0$
$100 - 16k^2 < 0$ $(\div -4)$
$-25 + 4k^2 > 0$
$4k^2 > 25$
$k^2 > 6.25$
$k > \pm 2.5$

$k > 2.5$ or $k < -2.5$

7 a) $y = f(x-3)$



b) $y = f(-2x)$

8 a) $y = 7x^2 - 6x - 3$

$$\frac{dy}{dx} = \lim_{h \to 0} \frac{7(x+h)^2 - 6(x+h) - 3 - (7x^2 - 6x - 3)}{h}$$

$$= \lim_{h \to 0} \frac{\cancel{7x^2} + 14xh + 7h^2 - \cancel{6x} - 6h - \cancel{3} - \cancel{7x^2} + \cancel{6x} + \cancel{3}}{h}$$

$$= \lim_{h \to 0} \frac{14xh + 7h^2 - 6h}{h}$$

$$= \lim_{h \to 0} 14x + 7h - 6$$

Pon fo $h \to 0$ $\frac{dy}{dx} = 14x - 6$

b) $y = ax^{\frac{4}{3}} + 24x^{\frac{1}{2}}$ $\qquad \frac{dy}{dx} = \frac{11}{2}$ para $x = 64$

$$\frac{dy}{dx} = \frac{4ax^{\frac{1}{3}}}{3} + 12x^{-\frac{1}{2}}$$

$$= \frac{4ax^{\frac{1}{3}}}{3} + \frac{12}{\sqrt{x}}$$

Para $x = 64$ $\qquad \frac{4a(64)^{\frac{1}{3}}}{3} + \frac{12}{\sqrt{64}} = \frac{11}{2}$

$$\frac{4a(4)}{3} + \frac{12}{8} = \frac{11}{2}$$

$$\frac{16a}{3} = \frac{11}{2} - \frac{3}{2}$$

$$\frac{16a}{3} = 4$$

$$16a = 12$$

$$a = \frac{12}{16} = \frac{3}{4}$$

9 a) $ax^3 + 13x^2 - 10x - 24$

$$f(-3) = -27a + 117 + 30 - 24 = -39$$

$$-27a = -162$$

$$a = \frac{-162}{-27}$$

$$a = 6$$

b) $6x^3 + 13x^2 - 10x - 24 = 0$

$f(1) \neq 0$

$f(-1) \neq 0$

$f(2) \neq 0$

$f(-2) = 0$ $\qquad \underline{\underline{x = -2}}$

$(x+2)(6x^2+x-12)=0$ (neu fel arall)

$(x+2)(6x^2+9x-8x-12)=0$ $\quad \begin{array}{c|c} \times & + \\ \hline 1 & -72 \end{array}$

$(9,-8)$

$(x+2)(3x(2x+3)-4(2x+3))=0$

$(x+2)(3x-4)(2x+3)=0$

$x=-2$ neu $x=\frac{4}{3}$ neu $x=-\frac{3}{2}$

10 a) $y=-2x^3+12x^2-18x+5$

$\frac{dy}{dx}=-6x^2+24x-18$

Pryn lleoliad arhosol $\frac{dy}{dx}=0$

$\therefore$ $-6x^2+24x-18=0$ $(\div -6)$

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

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

$x=3$ neu $x=1$

$y=5$ $\quad y=-3$

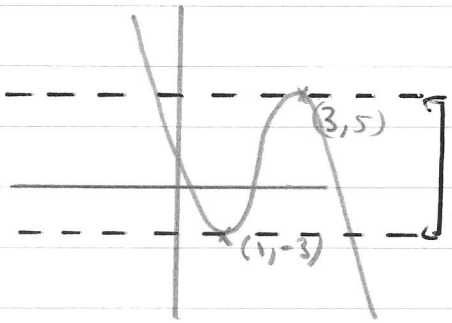
$\frac{d^2y}{dx^2}=-12x+24$ $\quad x=3$ $\frac{d^2y}{dx^2}=-12<0$ maes

$(3,5)$ maes

$x=1$ $\frac{d^2y}{dx^2}=12>0$ min

$(1,-3)$ min

b/c) $-2x^3+12x^2-18x+5=k$



tri gwreiddyn rhwng -3 a 5 $\quad \therefore \quad -3<k<5$