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1) $3\tan\theta + 2\cos\theta = 0$

$3\left(\frac{\sin\theta}{\cos\theta}\right) + 2\cos\theta = 0$

$3\left(\frac{\sin\theta}{\cos\theta}\right) = -2\cos\theta$

$3\sin\theta = -2\cos^2\theta$

$3\sin\theta = -2(1-\sin^2\theta)$

$3\sin\theta = -2 + 2\sin^2\theta$

$0 = 2\sin^2\theta - 3\sin\theta - 2$

$0 = (2\sin\theta + 1)(\sin\theta - 2)$

$\sin^2\theta + \cos^2\theta = 1$

$\cos^2\theta = 1 - \sin^2\theta$

Naill ai $2\sin\theta + 1 = 0$ neu $\sin\theta - 2 = 0$

$2\sin\theta = -1$

$\sin\theta = -\frac{1}{2}$

$\theta = \sin^{-1}\left(-\frac{1}{2}\right)$

$\sin\theta = 2$

$\theta = \sin^{-1}(2)$

Dim datrysiadau

(graff sin yn mynd rhwng -1 ac 1 yn unig)

S	A
T	C

$\theta = -30^\circ$

Hefyd $\theta = 210^\circ, 330^\circ$.

Atebion: $\theta = 210^\circ, 330^\circ$

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2) $x^2 + 2kx + 9k = -4x$

$x^2 + 2kx + 4x + 9k = 0$

$x^2 + (2k+4)x + 9k = 0$

I gael 2 wreiddyn real gwahanadwy, rhaid ir gwahanolyn $b^2 - 4ac$ fod yn bositif.

$a = 1$, $b = 2k + 4$, $c = 9k$.

$b^2 - 4ac > 0$

$(2k+4)^2 - 4(1)(9k) > 0$

$(2k+4)(2k+4) - 36k > 0$

$4k^2 + 8k + 8k + 16 - 36k > 0$

$4k^2 - 20k + 16 > 0$

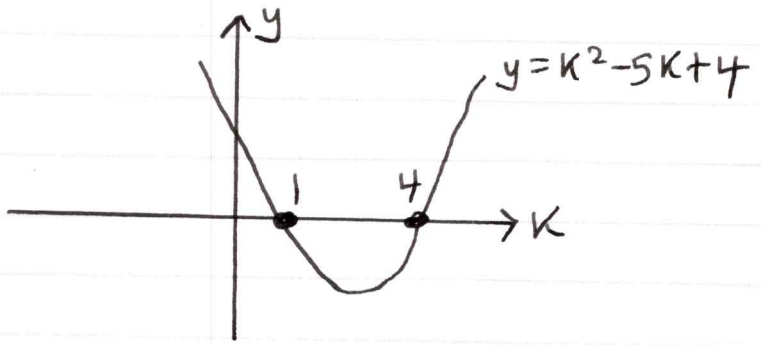
$k^2 - 5k + 4 > 0$

$(k-1)(k-4) > 0$

Gwerthoedd critigol $k - 1 = 0$, $k - 4 = 0$

$k = 1$ $k = 4$

Mae gan yr hafaliad $y = k^2 - 5k + 4$ graff siâp U



Mae $k^2 - 5k + 4 > 0$ os yw $k < 1$ neu $k > 4$

Dyma ble mae gan yr hafaliad $x^2 + 2kx + 9k = -4x$ ddau wreiddyn real gwahanadwy.

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3) $12x^3 - 29x^2 + 7x + 6 = 0$

Edrychwn am un gwreiddyn i gychwyn trwy amnewid.

$f(1) = -4$
$f(-1) = -42$
$f(2) = 0$

} Defnyddio TABLE MODE ar gyfrifiannell.

Felly mae $(x-2)$ yn ffactor o $12x^3 - 29x^2 + 7x + 6$.
Rhannu allan:

$$
\begin{array}{r|l}
 & 12x^2 - 5x - 3 \\
\hline
x-2 & 12x^3 - 29x^2 + 7x + 6 \\
 & \underline{12x^3 - 24x^2} \\
 & \quad -5x^2 + 7x + 6 \\
 & \quad \underline{-5x^2 + 10x} \\
 & \quad\quad -3x + 6 \\
 & \quad\quad \underline{-3x + 6} \\
 & \quad\quad\quad 0
\end{array}
$$

Felly $12x^3 - 29x^2 + 7x + 6 = (x-2)(12x^2 - 5x - 3)$

Ffactorio $12x^2 - 5x - 3$:

$-9 \times 4 = -36$
$-9 + 4 = -5$

$12x - 3 = -36$
$12x^2 - 9x + 4x - 3$
$= 3x(4x-3) + 1(4x-3)$
$= (3x+1)(4x-3)$.

Hafaliad gwreiddiol: $12x^3 - 29x^2 + 7x + 6 = 0$
$(x-2)(3x+1)(4x-3) = 0$

Naill ai $x - 2 = 0$ neu $3x + 1 = 0$ neu $4x - 3 = 0$

$x = 2$ $\quad$ $3x = -1$ $\quad$ $4x = 3$

$x = -\frac{1}{3}$ $\quad$ $x = \frac{3}{4}$

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4) L_1: Mynd trwy $A(-1, 3)$ a $B(2, 9)$
L_2: $2y + x = 25$
Mae L_2 yn croestorri L_1 yn C ac yn croestorri echelin-x yn D.

a) Graddiant $AB = \dfrac{y_2 - y_1}{x_2 - x_1}$

$= \dfrac{9 - 3}{2 - -1}$

$= \dfrac{6}{3}$

$= 2$

Hafaliad AB: $y - y_1 = m(x - x_1)$

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

$y - 3 = 2x + 2$

$y = 2x + 5$ ✓

b) i) Mae L_2 yn croestorri'r echelin-x pan fo $y = 0$

$2y + x = 25$

$2 \times 0 + x = 25$

$x = 25$

Felly $D = (25, 0)$

ii) L_2: $2y + x = 25$

$2y = -x + 25$

$y = -\frac{1}{2}x + 25$

Graddiant L_2 yw $-\frac{1}{2}$ (cymharu efo $y = mx + c$).

Graddiant L_1 x Graddiant L_2

$= 2 \times -\frac{1}{2}$

$= -1$

Felly mae L_1 ag L_2 yn berpendicwlar

iii) $L_1 : y = 2x + 5$ $\quad L_2 : 2y + x = 25$

Yn amnewid am y o L_1 i L_2:

$$2(2x+5) + x = 25$$
$$4x + 10 + x = 25$$
$$5x + 10 = 25$$
$$5x = 15$$
$$x = 3$$

Yn ôl yn L_1: $y = 2 \times 3 + 5$

$$y = 11$$

Felly $C = (3, 11)$.

c) $C = (3, 11)$ $\quad D = (25, 0)$

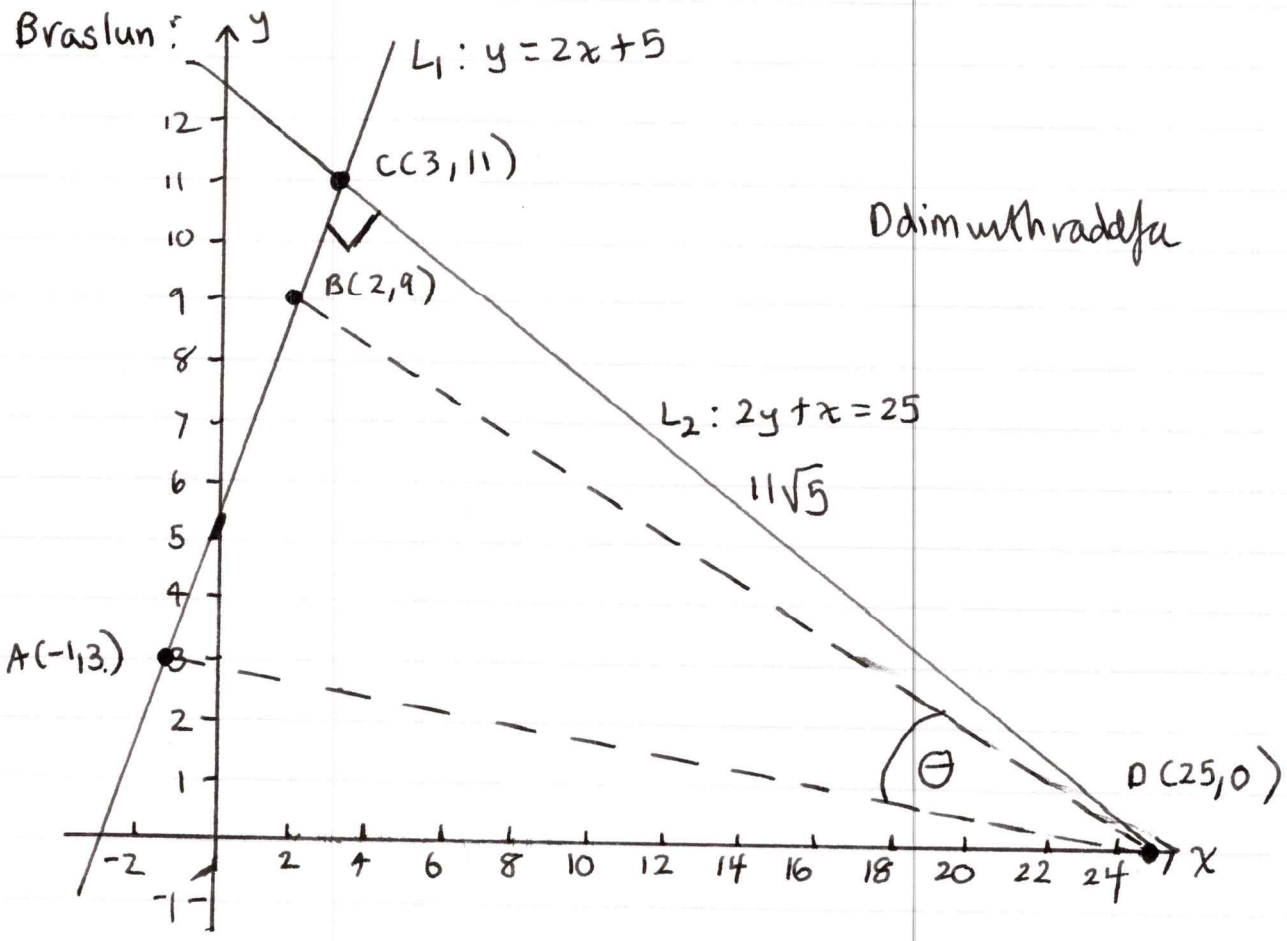
Hyd $CD = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

$= \sqrt{(25-3)^2 + (0-11)^2}$

$= \sqrt{484 + 121}$

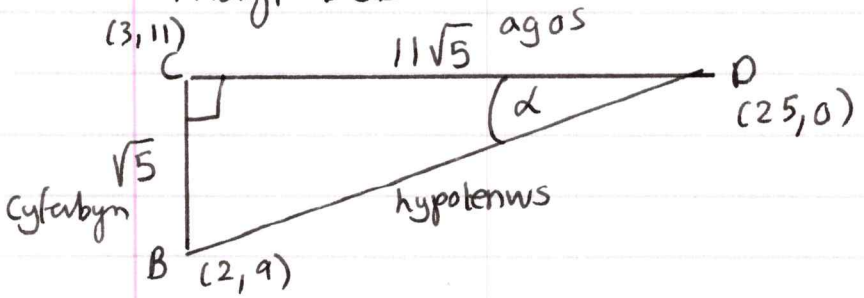
$= 11\sqrt{5}$

ch) Braslun:



Ddim wth raddfa

Triongl BCD



Hyd BC: $\sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$

$= \sqrt{(2-3)^2+(9-11)^2}$

$= \sqrt{1+4}$

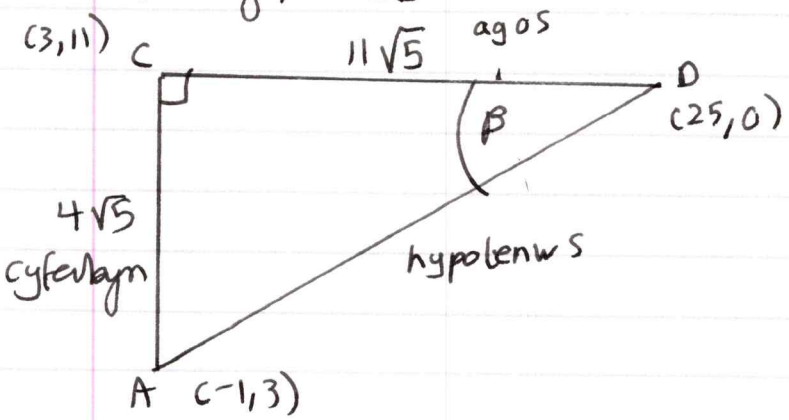
$= \sqrt{5}$

$\tan\alpha = \frac{\text{cyferbyn}}{\text{agos}}$

$\tan\alpha = \frac{\sqrt{5}}{11\sqrt{5}}$ → $\alpha = \tan^{-1}\left(\frac{1}{11}\right)$

$\alpha = 5.194428908^\circ$

Triongl ACD



Hyd AC: $\sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$

$= \sqrt{(-1-3)^2+(3-11)^2}$

$= \sqrt{16+64}$

$= 4\sqrt{5}$

$\tan\beta = \frac{\text{cyferbyn}}{\text{agos}}$

$\tan\beta = \frac{4\sqrt{5}}{11\sqrt{5}}$ → $\beta = \tan^{-1}\left(\frac{4}{11}\right)$

$\beta = 19.98310652^\circ$

Felly $\theta = \beta - \alpha = 19.98310652^\circ - 5.194428908^\circ$

$\underline{\theta = 14.8^\circ}$; un lle degol

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5) O wybod bod n yn gyfanrif fel bod $1 \leq n \leq 4$, profwch fod $2n^2 + 5$ yn rhif cysefin.

Prawf trwy ddisbyddu.

n	$2n^2 + 5$	Rhif cysefin?
1	$2 \times 1^2 + 5 = 7$	Ydi, mae 7 yn rhif cysefin
2	$2 \times 2^2 + 5 = 13$	Ydi, mae 13 yn rhif cysefin
3	$2 \times 3^2 + 5 = 23$	Ydi, mae 23 yn rhif cysefin
4	$2 \times 4^2 + 5 = 37$	Ydi, mae 37 yn rhif cysefin

Ar gyfer $1 \leq n \leq 4$, mae $2n^2 + 5$ wastad yn rhif cysefin.

QED

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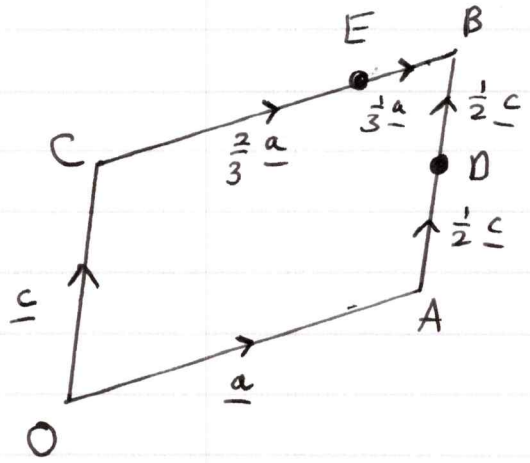
6)



a) i) $\underline{AC} = -\underline{a} + \underline{c}$

$= \underline{c} - \underline{a}$

ii) $D = \underline{a} + \frac{1}{2}\underline{c}$

iii) $E = \underline{c} + \frac{2}{3}\underline{a}$

b) $\underline{DE} = -\underline{d} + \underline{e}$

$= -(\underline{a} + \frac{1}{2}\underline{c}) + (\underline{c} + \frac{2}{3}\underline{a})$

$= -\underline{a} - \frac{1}{2}\underline{c} + \underline{c} + \frac{2}{3}\underline{a}$

$= -\frac{1}{3}\underline{a} + \frac{1}{2}\underline{c}$

$= \frac{1}{2}\underline{c} - \frac{1}{3}\underline{a}$

Nid yw DE yn baralel i AC gan nad yw $\underline{DE}$ yn lluosrif o $\underline{AC}$.

$\underline{AC} = \underline{c} - \underline{a}$

$\underline{DE} = \frac{1}{2}\underline{c} - \frac{1}{3}\underline{a}$

(Byddai raid i $\underline{DE}$ fod yn hafal i $\frac{1}{2}\underline{c} - \frac{1}{2}\underline{a}$ neu $\frac{1}{3}\underline{c} - \frac{1}{3}\underline{a}$ er mwyn i DE ac AC fod yn baralel.)

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7) a) $\dfrac{2\sqrt{3}+a}{\sqrt{3}-1} = \dfrac{(2\sqrt{3}+a)(\sqrt{3}+1)}{(\sqrt{3}-1)(\sqrt{3}+1)}$

$= \dfrac{2\times 3 + 2\sqrt{3} + a\sqrt{3} + a}{3 + \sqrt{3} - \sqrt{3} - 1}$

$= \dfrac{6 + 2\sqrt{3} + a\sqrt{3} + a}{2}$

$= \dfrac{6 + 2\sqrt{3} + a(\sqrt{3}+1)}{2}$

$= 3 + \sqrt{3} + \dfrac{a}{2}(\sqrt{3}+1)$

b) $\dfrac{2\sqrt{6b^2}}{\sqrt{2}} - \sqrt{27} + \sqrt{192}$

$= \dfrac{2\times\sqrt{6}\times\sqrt{b^2}}{\sqrt{2}} - \sqrt{3}\times\sqrt{9} + \sqrt{64}\times\sqrt{3}$

$= \dfrac{2\times\sqrt{3}\times\sqrt{2}\times\sqrt{b^2}}{\sqrt{2}} - \sqrt{3}\times 3 + 8\times\sqrt{3}$

$= 2\times\sqrt{3}\times b - 3\sqrt{3} + 8\sqrt{3}$

$= 2b\sqrt{3} - 3\sqrt{3} + 8\sqrt{3}$

$= 2b\sqrt{3} + 5\sqrt{3}$

$= \sqrt{3}(2b+5)$

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8) a) $y = 2x^2 - 5x$

$$\frac{dy}{dx} = \lim_{\delta x \to 0} \frac{f(x+\delta x) - f(x)}{\delta x}$$

$f(x) = 2x^2 - 5x$

$f(x+\delta x) = 2(x+\delta x)^2 - 5(x+\delta x)$

$= 2(x+\delta x)(x+\delta x) - 5x - 5\delta x$

$= 2(x^2 + x\delta x + x\delta x + (\delta x)^2) - 5x - 5\delta x$

$= 2(x^2 + 2x\delta x + (\delta x)^2) - 5x - 5\delta x$

$= 2x^2 + 4x\delta x + 2(\delta x)^2 - 5x - 5\delta x$

$f(x+\delta x) - f(x) = \cancel{2x^2} + 4x\delta x + 2(\delta x)^2 \cancel{- 5x} - 5\delta x$
$\cancel{- (2x^2 - 5x)}$

$= 4x\delta x + 2(\delta x)^2 - 5\delta x.$

$$\frac{f(x+\delta x) - f(x)}{\delta x} = \frac{4x\delta x + 2(\delta x)^2 - 5\delta x}{\delta x}$$

$$= 4x + 2\delta x - 5$$

$$\frac{dy}{dx} = \lim_{\delta x \to 0} 4x + 2\delta x - 5$$

$$= 4x + 2(0) - 5$$

$$\frac{dy}{dx} = 4x - 5$$

b) $y = \frac{16}{5}x^{\frac{1}{4}} + \frac{48}{x}$

$y = \frac{16}{5}x^{\frac{1}{4}} + 48x^{-1}$

$\frac{dy}{dx} = \frac{16}{5}\left(\frac{1}{4}x^{-\frac{3}{4}}\right) - 48x^{-2}$

→ os yw $x = 16$

$\frac{dy}{dx} = \frac{16}{5}\left(\frac{1}{4}(16)^{-\frac{3}{4}}\right) - 48(16)^{-2}$

$= \frac{1}{10} - \frac{3}{16}$

$\frac{dy}{dx} = -\frac{7}{80}$

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9) $A = (-2, 4)$ $B = (6, 10)$

Mae AB yn ddiamedr cylch.

a) Canol y cylch = canolbwynt AB

$$= \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$$

$$= \left(\frac{-2 + 6}{2}, \frac{4 + 10}{2}\right)$$

$$= \left(\frac{4}{2}, \frac{14}{2}\right)$$

$$= (2, 7) \quad \checkmark$$

b) Hyd y radiws = Hyd o'r canol at B

$$= \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

$$= \sqrt{(2-6)^2 + (7-10)^2}$$

$$= \sqrt{16 + 9}$$

$$= \sqrt{25}$$

$$= 5$$

Hafaliad cylch efo canol (a, b) a radiws r:

$$(x-a)^2 + (y-b)^2 = r^2$$

$$(x-2)^2 + (y-7)^2 = 5^2$$

$$(x-2)(x-2) + (y-7)(y-7) = 25$$

$$x^2 - 2x - 2x + 4 + y^2 - 7y - 7y + 49 = 25$$

$$x^2 - 4x + 4 + y^2 - 14y + 49 = 25$$

$$x^2 + y^2 - 4x - 14y + 4 + 49 - 25 = 0$$

$$x^2 + y^2 - 4x - 14y + 28 = 0$$

Felly $a = -4$, $b = -14$, $c = 28$.

c) $y = x + 6$

Yn amnewid i mewn i hafaliad y cylch:

$$x^2 + y^2 - 4x - 14y + 28 = 0$$
$$x^2 + (x+6)^2 - 4x - 14(x+6) + 28 = 0$$
$$x^2 + (x+6)(x+6) - 4x - 14x - 84 + 28 = 0$$
$$x^2 + x^2 + 6x + 6x + 36 - 4x - 14x - 84 + 28 = 0$$
$$2x^2 - 6x - 20 = 0$$
$$x^2 - 3x - 10 = 0$$
$$(x - 5)(x + 2) = 0$$

Naill ai $x - 5 = 0$ neu $x + 2 = 0$

$x = 5$ $\quad$ $x = -2$

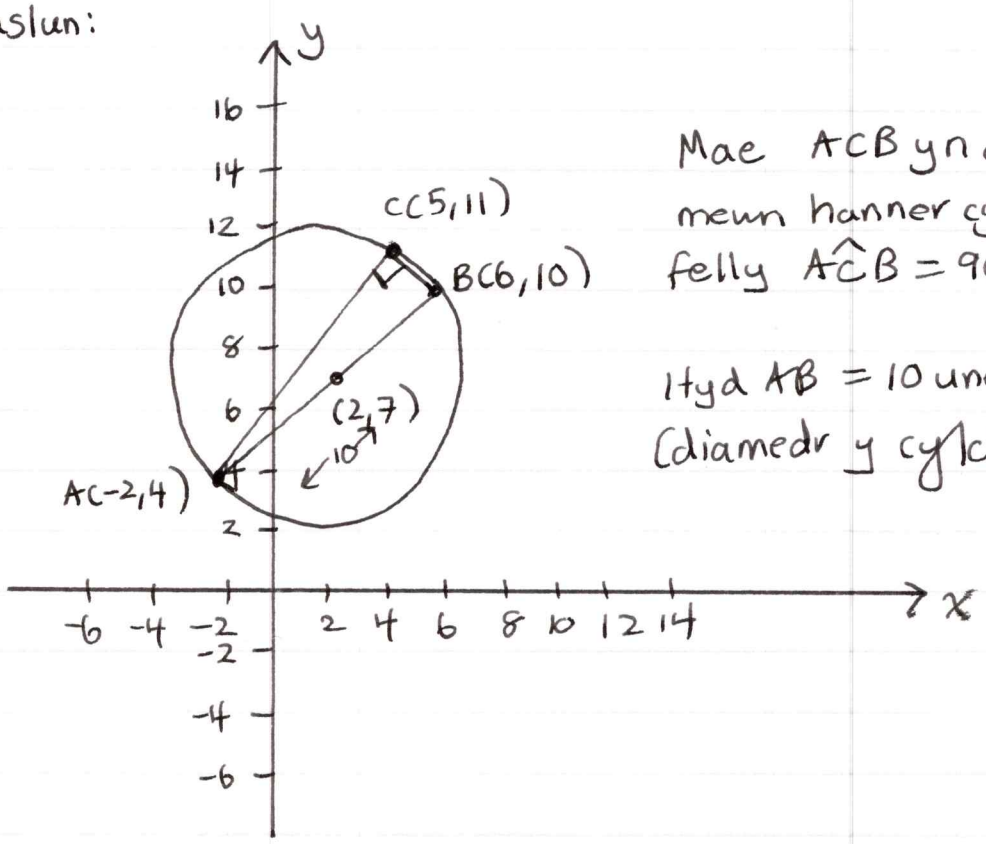
Felly $y = 5 + 6$ $\quad$ $y = -2 + 6$

$y = 11$ $\quad$ $y = 4$

↳ Itwn yw pwynt $A = (-2, 4)$

Felly $C = (5, 11)$

ch) Braslun:



Mae ACB yn driongl mewn hanner cylch felly $A\hat{C}B = 90^\circ$

Hyd AB = 10 uned (diamedr y cylch)

Hyd $AC = \sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$

$= \sqrt{(5--2)^2+(11-4)^2}$

$= \sqrt{49+49}$

$= \sqrt{98}$

$= 7\sqrt{2}$

Hyd $BC = \sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$

$= \sqrt{(6-5)^2+(10-11)^2}$

$= \sqrt{1+1}$

$= \sqrt{2}$

Arwynebedd triongl $ABC = \frac{\text{sail} \times \text{uchder}}{2}$

$= \frac{7\sqrt{2} \times \sqrt{2}}{2}$

$= \frac{7 \times 2}{2}$

$= 7$ uned sgwâr

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10) a) $3^{3x} \times 9^{y} = 27$

$3^{3x} \times (3^2)^{y} = 27$

$3^{3x} \times 3^{2y} = 27$

$3^{3x+2y} = 27$

$\log_3(3^{3x+2y}) = \log_3(27)$

$3x+2y = 3$ ①

$2^{-3x} \times 8^{-y} = \frac{1}{64}$

$2^{-3x} \times (2^3)^{-y} = \frac{1}{64}$

$2^{-3x} \times 2^{-3y} = \frac{1}{64}$

$2^{-3x-3y} = \frac{1}{64}$

$\log_2(2^{-3x-3y}) = \log_2(\frac{1}{64})$

$-3x-3y = -6$

$x+y = 2$

$x = 2-y$ ②

Amnewid am x o ② i ①:

$3(2-y)+2y = 3$

$6-3y+2y = 3$

$6-y = 3$

$6-3 = y$

$y = 3$

Felly, yn ôl yn ②

$x = 2-3$

$x = -1$

b) $\log_a 3 + 2\log_a x - \log_a(x-1) = \log_a(5x+2)$

$\log_a 3 + \log_a(x^2) - \log_a(x-1) = \log_a(5x+2)$

$\log_a(3x^2) - \log_a(x-1) = \log_a(5x+2)$

$\log_a\left(\frac{3x^2}{x-1}\right) = \log_a(5x+2)$

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

$3x^2 = (5x+2)(x-1)$

$3x^2 = 5x^2-5x+2x-2$

$3x^2 = 5x^2-3x-2$

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

$0 = (2x+1)(x-2)$

Naill ai $2x+1=0$ neu $x-2=0$

$x = -\frac{1}{2}$ $x=2$

Dim datrysiad: Nid yw log o rif negatif wedi ei ddiffinio.

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11) $Q = 1.25P^3$

$\log_{10}(Q) = \log_{10}(1.25P^3)$

$\log_{10}(Q) = \log_{10}(1.25) + \log_{10}(P^3)$

$\log_{10}(Q) = \log_{10}(1.25) + 3\log_{10}(P)$

$\log_{10}(Q) = 3\log_{10}(P) + \log_{10}(1.25)$

Yn cymharu efo $y = mx + c$, sef hafaliad llinell syth cyffredinol, byddai graff $\log_{10}(Q)$ yn erbyn $\log_{10}(P)$ yn rhoi llinell syth efo graddiant $\underline{3}$ a rhyngdoriad ar echelin $\log_{10}(Q)$ y graff o $\underline{\underline{\log_{10}(1.25)}}$.

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12) Triongl Pascal

1
1 1
1 2 1
1 3 3 1
1 4 6 4 1
1 5 10 10 5 1
1 6 15 20 15 6 1
1 7 21 35 35 21 7 1
1 8 28 56 70 56 28 8 1

a) nifer y termau = 8 + 1
= 9

b) 4ydd term: $56 \times (2)^5 \times (-5x)^3$
$= 56 \times 32 \times -125x^3$
$= -224000x^3$

c) $(2-5x)^8 = 1 \times (2)^8 \times (-5x)^0 + 8 \times (2)^7 \times (-5x)^1$
$+ 28 \times (2)^6 \times (-5x)^2 + 56 \times (2)^5 \times (-5x)^3$
$+ 70 \times (2)^4 \times (-5x)^4 + 56 \times (2)^3 \times (-5x)^5$
$+ 28 \times (2)^2 \times (-5x)^6 + 8 \times (2)^1 \times (-5x)^7$
$+ 1 \times (2)^0 \times (-5x)^8$
$= 256 - 5120x + 44800x^2$
$- 224000x^3 + 700000x^4$
$- 1400000x^5 + 1750000x^6$
$- 1250000x^7 + 390625x^8$

Y cyfernod positif mwyaf yw 1,750,000

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13) C: $y = \frac{1}{9}x^3 - Kx + 5$

Mae Q ar C fel bod y tangiad i C yn Q efo graddiant -9.

Q = (3, ?)

a) $\frac{dy}{dx} = \frac{1}{9}(3x^2) - K$

$\frac{dy}{dx} = \frac{1}{3}x^2 - K.$

os yw $x = 3$, mae $\frac{dy}{dx} = -9$, felly

$-9 = \frac{1}{3}(3^2) - K$

$-9 = \frac{1}{3} \times 9 - K$

$-9 = 3 - K$

$K = 3 + 9$

$\underline{K = 12}$ ✓

b) $y = \frac{1}{9}x^3 - 12x + 5$

$\frac{dy}{dx} = \frac{1}{3}x^2 - 12.$

Pwyntiau arhosol $\Rightarrow \frac{dy}{dx} = 0$

$\frac{1}{3}x^2 - 12 = 0$

$\frac{1}{3}x^2 = 12$

$x^2 = 36$

$x = \pm\sqrt{36}$

$x = \pm 6$

Naill ai $x = 6$ neu $x = -6$

Amnewid:

Naill ai $y = \frac{1}{9}(6^3) - 12(6) + 5$

$y = -43$

Neu $y = \frac{1}{9}(-6^3) - 12(-6) + 5$

$y = 53$

Felly mae pwyntiau arhosol yn y pwyntiau $(6, -43)$ a $(-6, 53)$

Natur? $\frac{d^2y}{dx^2} = \frac{1}{3}(2x)$

$\frac{d^2y}{dx^2} = \frac{2}{3}x$

os yw $x = 6$ mae $\frac{d^2y}{dx^2} = \frac{2}{3} \times 6$

$\frac{d^2y}{dx^2} = 4$

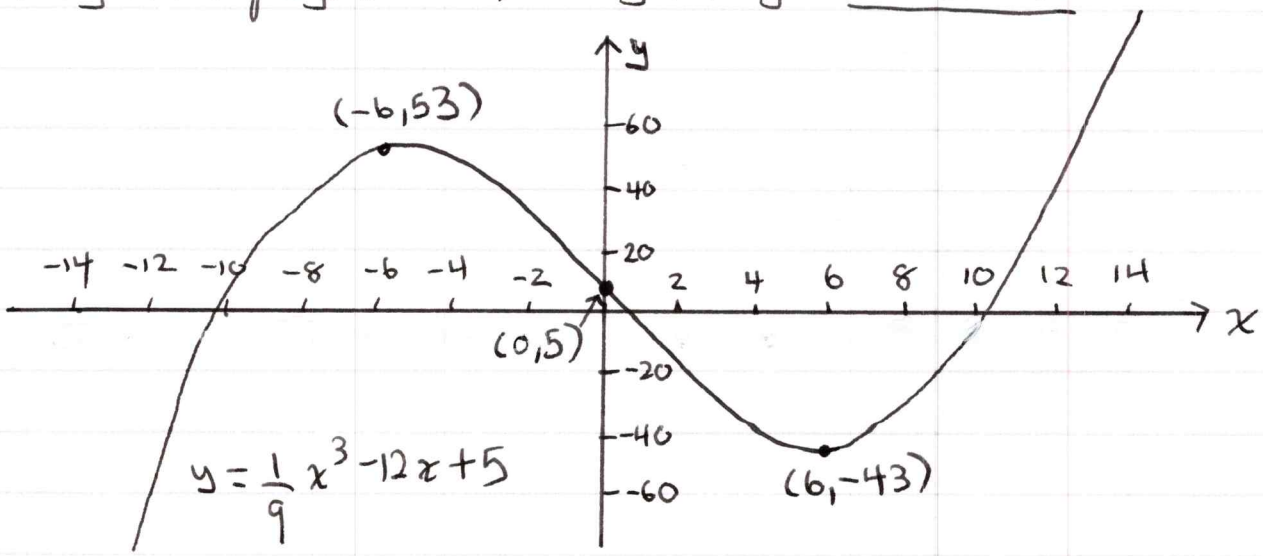
Felly mae'r pwynt $(6, -43)$ yn bwynt <u>minimwm</u>.

os yw $x = -6$ mae $\frac{d^2y}{dx^2} = \frac{2}{3}x - 6$

$\frac{d^2y}{dx^2} = -4$

Felly mae'r pwynt $(-6, 53)$ yn bwynt <u>macsimwm</u>.

c)



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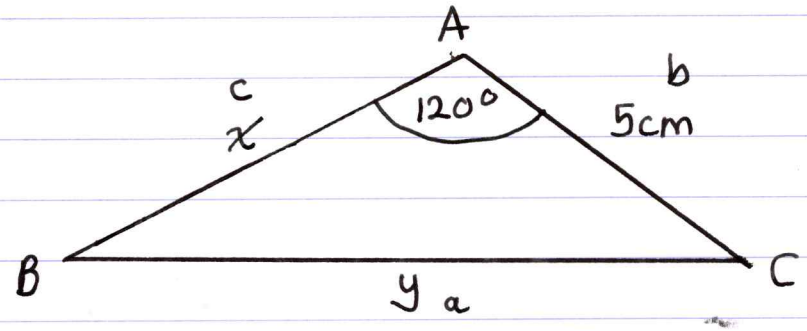
14)



Arwynebedd $= 14cm^2$

Arwynebedd triongl ABC $= 14cm^2$

$\frac{1}{2}bc\sin A = 14$

$\frac{1}{2}(5)(x)\sin(120°) = 14$

$\frac{5}{2}x\left(\frac{\sqrt{3}}{2}\right) = 14$

$5\sqrt{3}x = 14 \times 2 \times 2$

$x = \frac{56}{5\sqrt{3}}$

$x = \frac{56\sqrt{3}}{15}$

$x = 6.47cm$ i 2 le degol

Rheol Cosin: $a^2 = b^2 + c^2 - 2bc\cos A$

$y^2 = 5^2 + \left(\frac{56\sqrt{3}}{15}\right)^2 - 2 \times 5 \times \frac{56\sqrt{3}}{15} \times \cos 120°$

$y^2 = 25 + \frac{3136}{75} + \frac{56\sqrt{3}}{3}$

$y^2 = \frac{5011}{75} + \frac{56\sqrt{3}}{3}$

$y = \sqrt{\frac{5011}{75} + \frac{56\sqrt{3}}{3}}$

$y = 9.96cm$ i 2 le degol

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15) $f(x) = x^3 - 6x^2 + 13x - 7$

$f'(x) = 3x^2 - 12x + 13$

Os yw $f(x)$ yn ffwythiant cynyddol yna mae $f'(x) > 0$ ar gyfer pob gwerth o x.

Beth yw gwahanolyn $f'(x)$? $b^2 - 4ac$

$= (-12)^2 - 4 \times 3 \times 13$

$= 144 - 156$

$= -12$

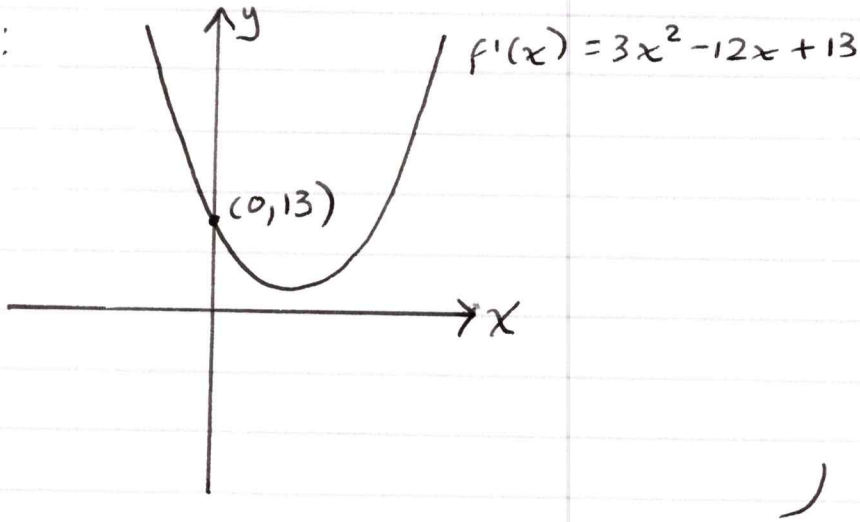
Gan fod gwahanolyn $f'(x)$ yn negatif nid oes gan $f'(x)$ wreiddiau real. Felly nid yw graff $f'(x)$ yn croestorri echelin-x. Gan fod $f'(0) = 3 \times 0^2 - 12 \times 0 + 13$

$= 0 - 0 + 13$

$= 13$ yn bositif

mae'n rhaid bod $f'(x) > 0$ ar gyfer pob gwerth o x.
Felly mae $f(x)$ yn ffwythiant cynyddol.

(Braslun o $f'(x)$:



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16) $y = (x+2)(x-2)(x+1)$

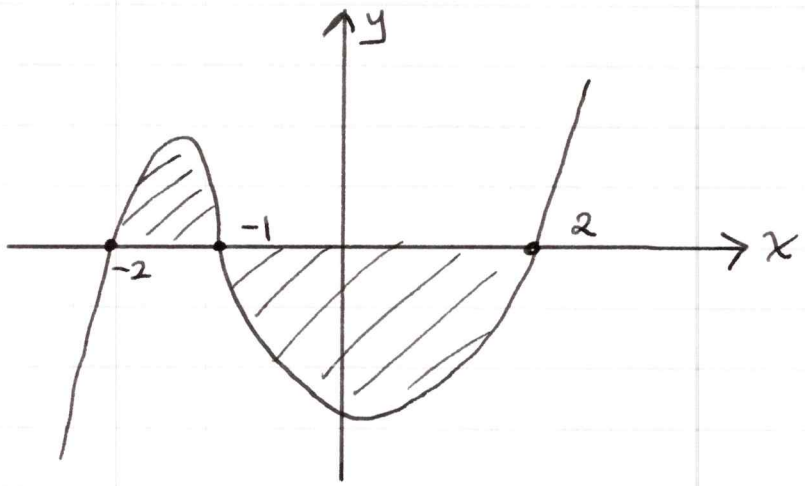
$y = (x^2 - 2x + 2x - 4)(x+1)$

$y = (x^2 - 4)(x+1)$

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

Gwreiddiau: Naill ai $x+2=0$ neu $x-2=0$ neu $x+1=0$

$x=-2$ $x=2$ $x=-1$



Arwynebedd $= \int_{-2}^{-1} x^3 + x^2 - 4x - 4 \, dx$

$+ \left| \int_{-1}^{2} x^3 + x^2 - 4x - 4 \, dx \right|$

$= \left[\frac{x^4}{4} + \frac{x^3}{3} - \frac{4x^2}{2} - 4x \right]_{-2}^{-1} + \left| \left[\frac{x^4}{4} + \frac{x^3}{3} - \frac{4x^2}{2} - 4x \right]_{-1}^{2} \right|$

$= \left[\frac{x^4}{4} + \frac{x^3}{3} - 2x^2 - 4x \right]_{-2}^{-1} + \left| \left[\frac{x^4}{4} + \frac{x^3}{3} - 2x^2 - 4x \right]_{-1}^{2} \right|$

$= \left[\left(\frac{(-1)^4}{4} + \frac{(-1)^3}{3} - 2(-1)^2 - 4(-1) \right) - \left(\frac{(-2)^4}{4} + \frac{(-2)^3}{3} - 2(-2)^2 - 4(-2) \right) \right]$

$+ \left| \left[\left(\frac{2^4}{4} + \frac{2^3}{3} - 2(2^2) - 4(2) \right) - \left(\frac{(-1)^4}{4} + \frac{(-1)^3}{3} - 2(-1)^2 - 4(-1) \right) \right] \right|$

$= \left[\left(\frac{1}{4} - \frac{1}{3} - 2 + 4 \right) - \left(4 - \frac{8}{3} - 8 + 8 \right) \right]$

$+ \left| \left[\left(4 + \frac{8}{3} - 8 - 8 \right) - \left(\frac{1}{4} - \frac{1}{3} - 2 + 4 \right) \right] \right|$

$= \left[\frac{23}{12} - \frac{4}{3} \right] + \left| \left[-\frac{28}{3} - \frac{23}{12} \right] \right|$

$= \frac{7}{12} + \left| -\frac{45}{4} \right|$

$= \frac{7}{12} + \frac{45}{4}$

$= \frac{71}{6}$ uned sgwâr.