

Ymarferion 5.2

- Canfyddwch x ac y ym mhob un o'r achosion canlynol
 - pan fydd $\mathbf{a} = (5 - x)\mathbf{i} + 3\mathbf{j}$, $\mathbf{b} = 9\mathbf{i} + (4 - y)\mathbf{j}$ ac $\mathbf{a} = \mathbf{b}$,
 - pan fydd $\mathbf{a} = (3 - x)\mathbf{i} + 4\mathbf{j}$, $\mathbf{b} = 2\mathbf{i} + (7 - y)\mathbf{j}$ ac $\mathbf{a} = 2\mathbf{b}$,
 - pan fydd $\mathbf{a} = (5 - x - y)\mathbf{i} + (3 - x)\mathbf{j}$, $\mathbf{b} = 4\mathbf{i} + (6 - y)\mathbf{j}$ a $2\mathbf{a} = -\mathbf{b}$.
- O wybod bod $\mathbf{a} = 2\mathbf{i} + 8\mathbf{j}$, $\mathbf{b} = -3\mathbf{i} + 5\mathbf{j}$, $\mathbf{c} = 5\mathbf{i} - 3\mathbf{j}$ canfyddwch
 - $2\mathbf{a} + 3\mathbf{b}$, (b) $5\mathbf{b} - 2\mathbf{a}$, (c) $2\mathbf{a} + 4\mathbf{b} + \mathbf{c}$, (d) $\mathbf{a} - 3\mathbf{b} + 2\mathbf{c}$.
- Canfyddwch fectorau safle y pwyntiau canlynol $P(1,4)$, $Q(3,-2)$, $R(-4,3)$, $S(-2,-6)$.
- Canfyddwch, ar gyfer y pwyntiau yn yr ymarfer blaenorol, \vec{PQ} , \vec{RS} , \vec{PS} , \vec{QR} , \vec{PR} .
- Canfyddwch feintiau'r fectorau canlynol a chanfyddwch y fectorau unedol ar hyd bob un. (a) $5\mathbf{i} + 12\mathbf{j}$, (b) $2\mathbf{i} - 7\mathbf{j}$, (c) $-3\mathbf{i} + 6\mathbf{j}$, (d) $-4\mathbf{i} - 6\mathbf{j}$.
- Yn y cwestiwn hwn mae d yn dynodi maint fector ac mae θ yn dynodi'r ongl rhyngddo a'r echelin x bositif (h.y. y fector unedol \mathbf{i}). Canfyddwch y ffurf cydrannau cartesaidd ar gyfer pob fector.
 - $d = 4$, $\theta = 60^\circ$, (b) $d = 6$, $\theta = 150^\circ$, (c) $d = 10$, $\theta = 200^\circ$, (d) $d = 3$, $\theta = -40^\circ$.
- Canfyddwch faint a chyfeiriad y fectorau canlynol.
 - $3\mathbf{i} + 7\mathbf{j}$, (b) $4\mathbf{i} - 6\mathbf{j}$, (c) $-2\mathbf{i} + 5\mathbf{j}$, (d) $-8\mathbf{i} - 4\mathbf{j}$.
- Diffinnir fectorau unedol \mathbf{i} a \mathbf{j} yn Ddwyrain a Gogledd yn ôl eu trefn. Rhewch y dadleoliadau canlynol ar ffurf cydrannau cartesaidd (a) 50 km, cyfeiriant 060° , (b) 80 km, cyfeiriant 120° , (c) 110 km, cyfeiriant 225° , (d) 75 km, cyfeiriant 300° .

Ymarferion 5.3

- Canfyddwch x , y a z ym mhob un o'r achosion canlynol
 - pan fydd $\mathbf{a} = (7 - x)\mathbf{i} + 4\mathbf{j} + 3\mathbf{k}$, $\mathbf{b} = 9\mathbf{i} + (4 - y)\mathbf{j} + (2 - z)\mathbf{k}$ ac $\mathbf{a} = \mathbf{b}$;
 - pan fydd $\mathbf{a} = (4 + x)\mathbf{i} + 11\mathbf{j} + 5\mathbf{k}$, $\mathbf{b} = 3\mathbf{i} + (8 - y)\mathbf{j} + (7 + 2z)\mathbf{k}$ ac $\mathbf{a} = 2\mathbf{b}$;
 - pan fydd $\mathbf{a} = (9 - x - y)\mathbf{i} + (2 - x)\mathbf{j} + (2 - 2z)\mathbf{k}$, $\mathbf{b} = 6\mathbf{i} + (5 - y)\mathbf{j} + (8 - 5z)\mathbf{k}$ a $2\mathbf{a} = -\mathbf{b}$.
- O wybod bod $\mathbf{a} = 3\mathbf{i} + 5\mathbf{j} + 3\mathbf{k}$, $\mathbf{b} = -3\mathbf{i} + 5\mathbf{j} + 2\mathbf{k}$, $\mathbf{c} = 4\mathbf{i} - 6\mathbf{j} - 3\mathbf{k}$, canfyddwch
 - $3\mathbf{a} + 3\mathbf{b}$, (b) $4\mathbf{b} - 3\mathbf{a}$, (c) $2\mathbf{a} + 5\mathbf{b} + \mathbf{c}$, (d) $\mathbf{a} - 2\mathbf{b} + 3\mathbf{c}$.
- Canfyddwch fectorau safle'r pwyntiau canlynol:
 $P(2, 3, 6)$, $Q(4, -3, 8)$, $R(-5, 4, -2)$, $S(-2, 6, -7)$.
- Canfyddwch, ar gyfer y pwyntiau yn y cwestiwn blaenorol, \vec{PQ} , \vec{RS} , \vec{PS} , \vec{QR} , \vec{PR} .
- Canfyddwch feintiau'r fectorau canlynol a'r fectorau unedol ar hyd pob un.
 - $4\mathbf{i} - 2\mathbf{j} + 4\mathbf{k}$, (b) $5\mathbf{i} + 2\mathbf{j} + 6\mathbf{k}$, (c) $4\mathbf{i} + 6\mathbf{j} - 3\mathbf{k}$.

Ymarferion 5.4

- Canfyddwch luosymiau sgalar y parau canlynol o fectorau (a) $7\mathbf{i} + 6\mathbf{j}$ a $3\mathbf{i} + 2\mathbf{j}$,
(b) $2\mathbf{i} - 6\mathbf{j}$ a $5\mathbf{i} - 6\mathbf{j}$, (c) $-3\mathbf{i} + 4\mathbf{j}$ ac $\mathbf{i} - 2\mathbf{j}$, (d) $-2\mathbf{i} - 5\mathbf{j}$ a $4\mathbf{i} - 3\mathbf{j}$.
- Canfyddwch yr onglau rhwng y parau canlynol o fectorau (a) $2\mathbf{i} + 5\mathbf{j}$ ac $\mathbf{i} + 6\mathbf{j}$,
(b) $3\mathbf{i} - 5\mathbf{j}$ a $4\mathbf{i} - 7\mathbf{j}$, (c) $-\mathbf{i} + 5\mathbf{j}$ a $2\mathbf{i} - 5\mathbf{j}$, (d) $-3\mathbf{i} - 4\mathbf{j}$ a $2\mathbf{i} + 9\mathbf{j}$.
- Canfyddwch fectorau sy'n berpendicwlar i (a) $4\mathbf{i} + 7\mathbf{j}$, (b) $9\mathbf{i} - 11\mathbf{j}$.
- Canfyddwch yr ongl rhwng y llinell sy'n cysylltu'r pwyntiau (1, 4) a (3, 2) a'r llinell sy'n cysylltu'r pwyntiau (5, 3) a (2, 8).
- Canfyddwch yr ongl rhwng \mathbf{a} a \mathbf{b} yn yr achosion canlynol:
(a) $a = 2, b = 4, \mathbf{a} \cdot \mathbf{b} = 3$, (b) $a = 4, b = 2, \mathbf{a} \cdot \mathbf{b} = -4$.
- O wybod bod $a = 1, b = 6, \mathbf{a} \cdot \mathbf{b} = 5$ canfyddwch $|\mathbf{a} - \mathbf{b}|$ a $|\mathbf{a} + \mathbf{b}|$.
- Canfyddwch (a) cydran \mathbf{a} yng nghyfeiriad y fector \mathbf{b} , (b) rhan gydrannol \mathbf{a} yng nghyfeiriad y fector \mathbf{b} , (c) rhan gydrannol \mathbf{a} mewn cyfeiriad perpendicwlar i'r fector \mathbf{b} , ar gyfer yr achosion (a) $\mathbf{a} = 11\mathbf{i} + 4\mathbf{j}, \mathbf{b} = 3\mathbf{i} - 4\mathbf{j}$, (b) $\mathbf{a} = 12\mathbf{i} - 15\mathbf{j}, \mathbf{b} = 12\mathbf{i} + 5\mathbf{j}$.

Ymarferion 5.5

- Canfyddwch luosymiau sgalar y parau canlynol o fectorau
(a) $2\mathbf{i} + 4\mathbf{j} - 3\mathbf{k}$ ac $\mathbf{i} + 6\mathbf{j} - 4\mathbf{k}$, (b) $3\mathbf{i} - \mathbf{j} + 6\mathbf{k}$ ac $\mathbf{i} - 2\mathbf{j} - 3\mathbf{k}$,
(c) $8\mathbf{i} + 5\mathbf{j} - 3\mathbf{k}$ ac $\mathbf{i} + \mathbf{j} - \mathbf{k}$, (d) $3\mathbf{i} - 2\mathbf{j} + 5\mathbf{k}$ ac $2\mathbf{i} + \mathbf{j} - 2\mathbf{k}$.
- Canfyddwch ba rai o'r parau canlynol o fectorau sy'n berpendicwlar i'w gilydd a chanfyddwch yr onglau rhwng y parau hynny nad ydynt yn berpendicwlar i'w gilydd,
(a) $2\mathbf{i} + 4\mathbf{j} - 2\mathbf{k}$ ac $\mathbf{i} + 6\mathbf{j} + 13\mathbf{k}$, (b) $2\mathbf{i} - 4\mathbf{j} + 3\mathbf{k}$ ac $\mathbf{i} - 3\mathbf{j} - 2\mathbf{k}$,
(c) $4\mathbf{i} + 7\mathbf{j} - 3\mathbf{k}$ ac $\mathbf{i} + 2\mathbf{j} - \mathbf{k}$, (d) $3\mathbf{i} - 4\mathbf{j} + 5\mathbf{k}$ ac $\mathbf{i} + 2\mathbf{j} + \mathbf{k}$.
- Canfyddwch yr ongl rhwng y llinell sy'n cysylltu'r pwyntiau (1, 4, 6) a (3, 2, 1) a'r llinell sy'n cysylltu'r pwyntiau (5, 3, 5) a (2, 8, 4).
- O wybod bod $a^2 = 6, b^2 = 2, \mathbf{a} \cdot \mathbf{b} = 2$, canfyddwch $|2\mathbf{a} + 3\mathbf{b}|$, $|3\mathbf{a} - 2\mathbf{b}|$.
- O wybod bod $\mathbf{a} = 5\mathbf{i} - 3\mathbf{j} - 4\mathbf{k}$, a bod $\mathbf{b} = \mathbf{i} + 2\mathbf{j} - 2\mathbf{k}$ canfyddwch y sgalar p fel bod $p\mathbf{a} + \mathbf{b}$ yn berpendicwlar i \mathbf{a} .
- O wybod bod $\mathbf{a} = 5\mathbf{i} + \mathbf{j} - 3\mathbf{k}$, a $\mathbf{b} = \mathbf{i} + 3\mathbf{j} - 5\mathbf{k}$ dangoswch fod y fectorau $\mathbf{a} + \mathbf{b}$ ac $\mathbf{a} - \mathbf{b}$ yn berpendicwlar i'w gilydd.
- Canfyddwch (a) cydran \mathbf{a} yng nghyfeiriad y fector \mathbf{b} , (b) y rhan gydrannol o \mathbf{a} yng nghyfeiriad y fector \mathbf{b} , (c) y rhan gydrannol o \mathbf{a} mewn cyfeiriad perpendicwlar i'r fector \mathbf{b} , ar gyfer yr achosion
(a) $\mathbf{a} = 5\mathbf{i} + 6\mathbf{j} + 3\mathbf{k}, \mathbf{b} = 2\mathbf{i} + \mathbf{j} + 2\mathbf{k}$,
(b) $\mathbf{a} = 3\mathbf{i} + 7\mathbf{j} - 2\mathbf{k}, \mathbf{b} = 3\mathbf{i} + 4\mathbf{j} + 12\mathbf{k}$.

Ymarferion 5.6

- Canfyddwch $\frac{d\mathbf{a}}{dt}$ a $\frac{d^2\mathbf{a}}{dt^2}$ ar gyfer

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| (a) $\mathbf{a} = 2t\mathbf{i} + 5t^4\mathbf{j}$, | (b) $\mathbf{a} = e^t\mathbf{i} + t^3\mathbf{j}$, |
| (c) $\mathbf{a} = \cos t\mathbf{i} + \sin 2t\mathbf{j}$, | (d) $\mathbf{a} = t^2\mathbf{i} + t\mathbf{j} + t^3\mathbf{k}$, |
| (e) $\mathbf{a} = \cos t\mathbf{i} + t^4\mathbf{j} + \sin 3t\mathbf{k}$, | (f) $\mathbf{a} = e^{2t}\mathbf{i} + \cos t\mathbf{j} + \ln t\mathbf{k}$. |

- 2 O wybod bod \mathbf{a} a \mathbf{b} yn fectorau cyson canfyddwch ddeilliad y canlynol mewn perthynas â t
- (a) $\frac{\mathbf{a}}{t}$, (b) $\mathbf{a} \cos t + t^2 \mathbf{b}$, (c) $e^t \mathbf{a} + 2 e^{-t} \mathbf{b}$.
- 3 O wybod bod $\mathbf{r} = \cos nt \mathbf{a} + \sin nt \mathbf{b}$, lle mae \mathbf{a} a \mathbf{b} yn fectorau cyson ac n yn gysonyn, canfyddwch y berthynas rhwng \mathbf{r} a $\frac{d^2 \mathbf{r}}{dt^2}$.
- 4 Integrwch y mynegiadau canlynol mewn perthynas â t :
- (a) $4t^3 \mathbf{i} + 6t^5 \mathbf{j}$, (b) $2e^{2t} \mathbf{i} + t^2 \mathbf{j}$, (c) $2 \cos 2t \mathbf{i} + \sin t \mathbf{j}$, (d) $3t^2 \mathbf{i} + 2t \mathbf{j} + 4t^3 \mathbf{k}$, (e) $2 \cos t \mathbf{i} + 5t^4 \mathbf{j} + 4 \sin t \mathbf{k}$, (f) $2e^{2t} \mathbf{i} + 4 \cos 4t \mathbf{j} + 2t \mathbf{k}$.
- 5 Enrhifwch (a) $\int_{-1}^2 (12t^3 \mathbf{i} + 15t^4 \mathbf{j}) dt$, (b) $\int_{-1}^2 (6t^5 \mathbf{i} + 4t \mathbf{j} + 8t^3 \mathbf{k}) dt$.
- 6 Canfyddwch \mathbf{r} pan fydd (a) $\frac{d\mathbf{r}}{dt} = 7t^6 \mathbf{i} + 3t^2 \mathbf{j}$ ac $\mathbf{r} = 4\mathbf{i} + 6 \mathbf{j}$ ar gyfer $t = 1$,
 (b) $\frac{d\mathbf{r}}{dt} = 3t^2 \mathbf{i} + 2t \mathbf{j} + 4t^3 \mathbf{k}$ ac $\mathbf{r} = 6\mathbf{i} + 7\mathbf{j} + 8\mathbf{k}$ ar gyfer $t = 1$.
- 7 Canfyddwch fynegiad ar gyfer \mathbf{r} pan fydd $\frac{d^2 \mathbf{r}}{dt^2} = \mathbf{a}$, lle mae \mathbf{a} yn fector cyson.

Atebion

Ymarferion 5.2

- 1 (a) $x = -4, y = 1$, (b) $x = -1, y = 5$, (c) $x = 5, y = 2$
- 2 (a) $-5\mathbf{i} + 31\mathbf{j}$ (b) $-19\mathbf{i} + 9\mathbf{j}$ (c) $-3\mathbf{i} + 33\mathbf{j}$ (d) $21\mathbf{i} - 13\mathbf{j}$
- 3 $\mathbf{i} + 4\mathbf{j}, 3\mathbf{i} - 2\mathbf{j}, -4\mathbf{i} + 3\mathbf{j}, -2\mathbf{i} - 6\mathbf{j}$
- 4 $2\mathbf{i} - 6\mathbf{j}, 2\mathbf{i} - 9\mathbf{j}, -3\mathbf{i} - 10\mathbf{j}, -7\mathbf{i} + 5\mathbf{j}, -5\mathbf{i} - \mathbf{j}$
- 5 (a) $13, \frac{5\mathbf{i} + 12\mathbf{j}}{13}$, (b) $\sqrt{53}, \frac{2\mathbf{i} - 7\mathbf{j}}{\sqrt{53}}$
- (c) $\sqrt{45}, \frac{-\mathbf{i} + 2\mathbf{j}}{\sqrt{5}}$ (d) $\sqrt{52}, \frac{-2\mathbf{i} - 3\mathbf{j}}{\sqrt{13}}$
- 6 (a) $2\mathbf{i} + 2\sqrt{3}\mathbf{j}$, (b) $-3\sqrt{3}\mathbf{i} + 3\mathbf{j}$, (c) $-9.4\mathbf{i} - 3.42\mathbf{j}$, (d) $2.3\mathbf{i} - 1.93\mathbf{j}$
- 7 (a) $\sqrt{58}$ ar ongl o 66.8° i \mathbf{i} yn y pedrant cyntaf
 (b) $\sqrt{52}$ ar ongl o 56.3° i \mathbf{i} yn y pedwerydd pedrant
 (c) $\sqrt{29}$ ar ongl o 68.2° i \mathbf{i} yn yr ail gwadrant
 (d) $\sqrt{80}$ ar ongl o 26.6° i \mathbf{i} yn y trydydd cwadrant
- 8 (a) $25(\sqrt{3}\mathbf{i} + \mathbf{j})$ km, (b) $40(\sqrt{3}\mathbf{i} - \mathbf{j})$ km, (c) $-55\sqrt{2}(\mathbf{i} + \mathbf{j})$ km
 (d) $37.5(-\sqrt{3}\mathbf{i} + \mathbf{j})$ km

Ymarferion 5.3

- 1 (a) $x = -2, y = 0, z = -1$, (b) $x = 2, y = 2.5, z = 2.25$, (c) $x = -3, y = 15, z = \frac{4}{3}$
- 2 (a) $30\mathbf{j} + 15\mathbf{k}$, (b) $-2\mathbf{i} + 5\mathbf{j} - \mathbf{k}$ (c) $-5\mathbf{i} + 29\mathbf{j} + 13\mathbf{k}$
 (d) $2\mathbf{i} - 23\mathbf{j} - 10\mathbf{k}$
- 3 $2\mathbf{i} + 3\mathbf{j} + 6\mathbf{k}, 4\mathbf{i} - 3\mathbf{j} + 8\mathbf{k}, -5\mathbf{i} + 4\mathbf{j} - 2\mathbf{k}, -2\mathbf{i} + 6\mathbf{j} - 7\mathbf{k}$
- 4 $2\mathbf{i} - 6\mathbf{j} + 2\mathbf{k}, 3\mathbf{i} + 2\mathbf{j} - 5\mathbf{k}, -4\mathbf{i} + 3\mathbf{j} - 13\mathbf{k}, -9\mathbf{i} + 7\mathbf{j} - 10\mathbf{k}, -7\mathbf{i} + \mathbf{j} - 8\mathbf{k}$
- 5 (a) $6, \frac{2\mathbf{i} - \mathbf{j} + 2\mathbf{k}}{3}$, (b) $\sqrt{65}, \frac{5\mathbf{i} + 2\mathbf{j} + 6\mathbf{k}}{\sqrt{65}}$ (c) $\sqrt{61}, \frac{4\mathbf{i} + 6\mathbf{j} - 3\mathbf{k}}{\sqrt{61}}$

Ymarferion 5.4

- (a) 33, (b) 46, (c) -11, (d) 7
- (a) 12.3° , (b) 1.22° (c) 169.5° (d) 155.7°
- (a) $7\mathbf{i} - 4\mathbf{j}$ (b) $11\mathbf{i} + 9\mathbf{j}$
- 166°
- (a) 68° (b) 120°
- 5.2, 6.86
- (a) $\frac{17}{5}, \frac{17}{25}(3\mathbf{i} - 4\mathbf{j}), \frac{56}{25}(4\mathbf{i} + 3\mathbf{j})$, (b) $\frac{69}{13}, \frac{69}{169}(12\mathbf{i} + 5\mathbf{j}), \frac{240}{169}(5\mathbf{i} - 12\mathbf{j})$

Ymarferion 5.5

- (a) 38, (b) -13, (c) 16, (d) -6
- (a) perpendicwlar, (b) 66.6° , (c) 4.72° , (d) perpendicwlar
- 108.9°
- $\sqrt{66}, \sqrt{20}$
- $p = -\frac{7}{50}$
- (a) $\frac{22}{3}, \frac{22}{9}(2\mathbf{i} + \mathbf{j} + 2\mathbf{k}), \frac{\mathbf{i} + 32\mathbf{j} - 17\mathbf{k}}{9}$
(b) $1, \frac{3\mathbf{i} + 4\mathbf{j} + 12\mathbf{k}}{13}, \frac{36\mathbf{i} + 87\mathbf{j} + 38\mathbf{k}}{13}$

Ymarferion 5.6

- (a) $2\mathbf{i} + 20t^3\mathbf{j}, 60t^2\mathbf{j}$ (b) $e^t\mathbf{i} + 3t^2\mathbf{j}, e^t\mathbf{i} + 6t\mathbf{j}$
(c) $-\sin t\mathbf{i} + 2\cos 2t\mathbf{j}, -\cos t\mathbf{i} - 4\sin 2t\mathbf{j}$ (d) $2t\mathbf{i} + \mathbf{j} + 3t^2\mathbf{k}, 2\mathbf{i} + 6t\mathbf{k}$
(e) $-\sin t\mathbf{i} + 4t^3\mathbf{j} + 3\cos 3t\mathbf{k}, -\cos t\mathbf{i} + 12t^2\mathbf{j} - 9\sin 3t\mathbf{k}$
(f) $2e^{2t}\mathbf{i} - \sin t\mathbf{j} + \frac{1}{t}\mathbf{k}, 4e^{2t}\mathbf{i} - \cos t\mathbf{j} - \frac{1}{t^2}\mathbf{k}$
- (a) $-\frac{a}{t^2}$, (b) $-a\sin t + 2tb$, (c) $e^t a - 2e^{-tb}$
- $\frac{d^2\mathbf{r}}{dt^2} = -n^2\mathbf{r}$
- (a) $t^4\mathbf{i} + t^6\mathbf{j} + \mathbf{b}$, (b) $e^{2t}\mathbf{i} + \frac{1}{3}t^3\mathbf{j} + \mathbf{b}$, (c) $\sin 2t\mathbf{i} - \cos t\mathbf{j} + \mathbf{b}$,
(d) $t^3\mathbf{i} + t^2\mathbf{j} + t^4\mathbf{k} + \mathbf{b}$, (e) $2\sin t\mathbf{i} + t^5\mathbf{j} - 4\cos t\mathbf{k} + \mathbf{b}$,
(f) $e^{2t}\mathbf{i} + \sin 4t\mathbf{j} + t^2\mathbf{k} + \mathbf{b}$.
- (a) $45\mathbf{i} + 99\mathbf{j}$, (b) $63\mathbf{i} + 6\mathbf{j} + 30\mathbf{k}$
- (a) $\mathbf{r} = t^7\mathbf{i} + t^3\mathbf{j} + 3\mathbf{i} + 5\mathbf{j}$, (b) $\mathbf{r} = t^3\mathbf{i} + t^2\mathbf{j} + t^4\mathbf{k} + 5\mathbf{i} + 6\mathbf{j} + 7\mathbf{k}$
- $\mathbf{r} = \frac{1}{2}t^2\mathbf{a} + t\mathbf{b} + \mathbf{c}$, lle mae \mathbf{b} a \mathbf{c} yn fectorau cyson