

Given that $\mathbf{r} = 6\mathbf{i} + c\mathbf{j}$, where c is a positive constant, find the value of c such that

a \mathbf{r} is parallel to the vector $2\mathbf{i} + \mathbf{j}$

b \mathbf{r} is parallel to the vector $-9\mathbf{i} - 6\mathbf{j}$

c $|\mathbf{r}| = 10$

d $|\mathbf{r}| = 3\sqrt{5}$

Given that $|3\mathbf{i} + k\mathbf{j}| = 3\sqrt{17}$

Find the value of k

The points D , E and F have coordinates $(-3, 2)$, $(4, -1)$ and $(1, -8)$ respectively.

(a) Show that angle DEF is a right angle. (4)

Given that D , E and F all lie on the circle C .

(b) Find the coordinates of the centre of C . (3)

(c) Find the equation of the circle C . (3)

The circle C has the equation $x^2 + y^2 - 6x + 2y = 6$

(a) Find the coordinates of the centre and the radius of C (3)

C crosses the y axis at the points A and B

(b) Find the coordinates of the points A and B (3)

Given that $\mathbf{p} = \mathbf{i} + 3\mathbf{j}$ and $\mathbf{q} = 4\mathbf{i} - 2\mathbf{j}$,

- a** find the values of a and b such that $a\mathbf{p} + b\mathbf{q} = -5\mathbf{i} + 13\mathbf{j}$,
- b** find the value of c such that $c\mathbf{p} + \mathbf{q}$ is parallel to the vector \mathbf{j} ,
- c** find the value of d such that $\mathbf{p} + d\mathbf{q}$ is parallel to the vector $3\mathbf{i} - \mathbf{j}$.

In triangle ABC , $\vec{AB} = 6\mathbf{i} + 2\mathbf{j}$, $\vec{AC} = 8\mathbf{i} - 5\mathbf{j}$

(a) Find the vector \vec{BC} (2)

(b) Find the length of the line AB (2)

The circle C has centre $(1, 5)$ and passes through the point $A(-4, 3)$.

(a) Find an equation for C . (4)

(b) Find an equation for the tangent to C and A , giving your answer in the form $ax + by + c = 0$, where a , b and c are integers (4)

The point P lies on the circle with equation $x^2 + y^2 + 12x - 6y + 27 = 0$ and the point Q has coordinates $(8, 1)$. Find the minimum length of PQ giving your answer in the form $k\sqrt{2}$.

Relative to a fixed origin O , the points A and B have position vectors $\begin{pmatrix} 3 \\ 6 \end{pmatrix}$ and $\begin{pmatrix} -5 \\ 2 \end{pmatrix}$ respectively.

Find

- a the vector \overrightarrow{AB} ,
- b $|\overrightarrow{AB}|$,
- c the position vector of the mid-point of AB ,
- d the position vector of the point C such that $OABC$ is a parallelogram.

Given that the point A has position vector $-5\mathbf{i} + 7\mathbf{j}$ and the point B has position vector $-8\mathbf{i} + 2\mathbf{j}$

(a) Find the vector \overrightarrow{AB} (2)

(b) Find $|\overrightarrow{AB}|$ (2)

The line with equation $y = x + k$ is a tangent to the circle with equation $x^2 + y^2 + 6x - 8y + 17 = 0$.
Find the two possible values of k .

The line with equation $y = mx$ is a tangent to the circle with equation $x^2 + y^2 - 8x - 16y + 72 = 0$.
Find the two possible values of m .