

1. (a) Solve the inequality

$$3x - 8 > x + 13.$$

(2)

- (b) Solve the inequality

$$x^2 - 5x - 14 > 0.$$

(3)

2. Given that $2^x = \frac{1}{\sqrt{2}}$ and $2^y = 4\sqrt{2}$,

- (a) find the exact value of x and the exact value of y ,

(3)

- (b) calculate the exact value of 2^{y-x} .

(2)

3. (a) Prove, by completing the square, that the roots of the equation $x^2 + 2kx + c = 0$, where k and c are constants, are $-k \pm \sqrt{k^2 - c}$.

(4)

The equation $x^2 + 2kx \pm 81 = 0$ has equal roots.

- (b) Find the possible values of k .

(2)

4. In the first month after opening, a mobile phone shop sold 280 phones. A model for future trading assumes that sales will increase by x phones per month for the next 35 months, so that $(280 + x)$ phones will be sold in the second month, $(280 + 2x)$ in the third month, and so on.

Using this model with $x = 5$, calculate

- (a) (i) the number of phones sold in the 36th month,

(2)

- (ii) the total number of phones sold over the 36 months.

(2)

The shop sets a sales target of 17 000 phones to be sold over the 36 months.

Using the same model,

- (b) find the least value of x required to achieve this target.

(4)

5.

Figure 1

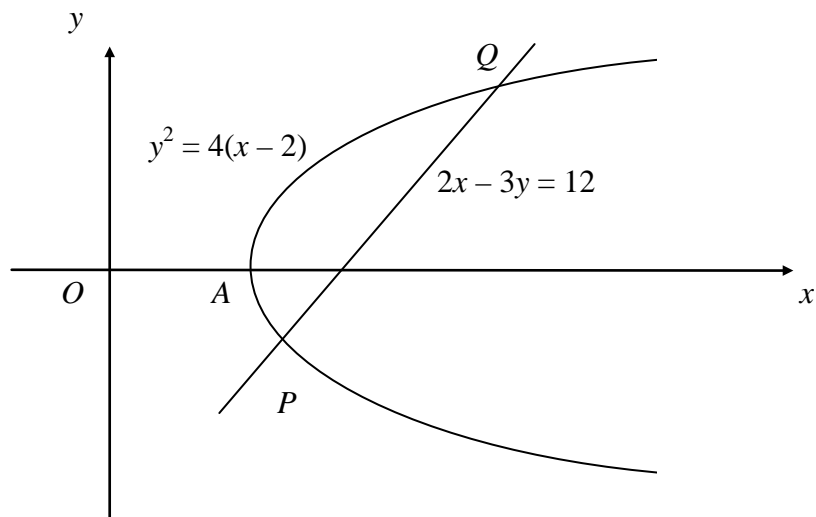


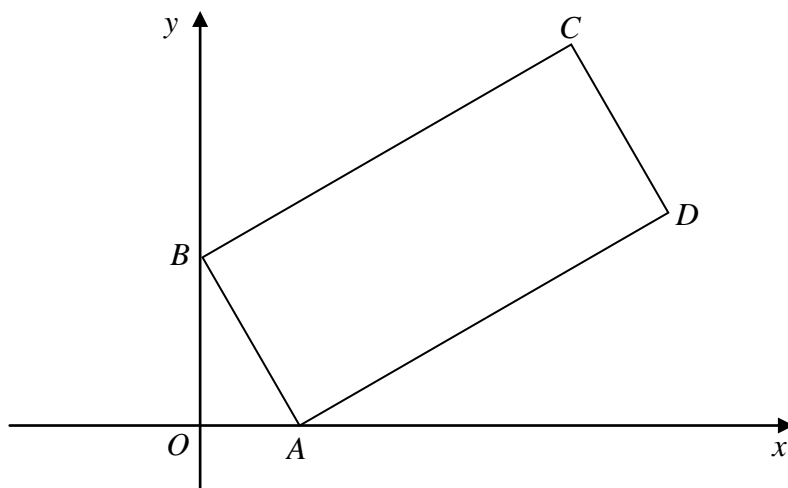
Figure 1 shows the curve with equation $y^2 = 4(x - 2)$ and the line with equation $2x - 3y = 12$.

The curve crosses the x -axis at the point A , and the line intersects the curve at the points P and Q .

- (a) Write down the coordinates of A . (1)
- (b) Find, using algebra, the coordinates of P and Q . (6)
- (c) Show that $\angle PAQ$ is a right angle. (4)

6.

Figure 2



The points $A(3, 0)$ and $B(0, 4)$ are two vertices of the rectangle $ABCD$, as shown in Fig. 2.

- (a) Write down the gradient of AB and hence the gradient of BC . (3)

The point C has coordinates $(8, k)$, where k is a positive constant.

- (b) Find the length of BC in terms of k . (2)

Given that the length of BC is 10 and using your answer to part (b),

- (c) find the value of k , (4)

- (d) find the coordinates of D . (2)
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7. The curve C has equation $y = f(x)$. Given that

$$\frac{dy}{dx} = 3x^2 - 20x + 29$$

and that C passes through the point $P(2, 6)$,

(a) find y in terms of x . (4)

(b) Verify that C passes through the point $(4, 0)$. (2)

(c) Find an equation of the tangent to C at P . (3)

The tangent to C at the point Q is parallel to the tangent at P .

(d) Calculate the exact x -coordinate of Q . (5)

END

