

5.

Figure 1

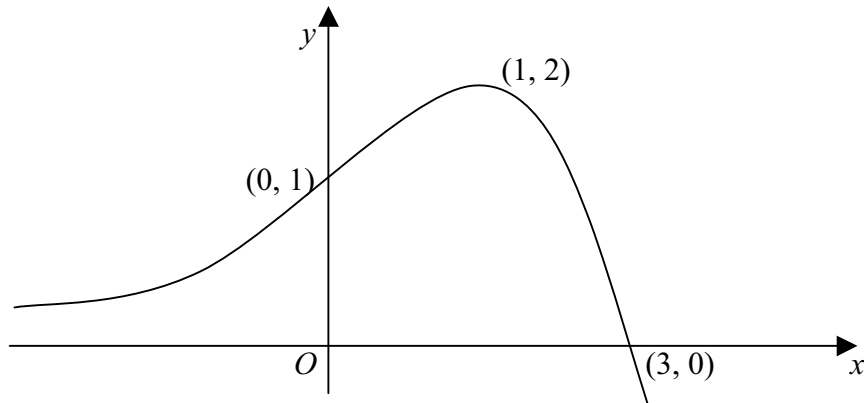


Figure 1 shows a sketch of the curve with equation $y = f(x)$.

The curve crosses the coordinate axes at the points $(0, 1)$ and $(3, 0)$. The maximum point on the curve is $(1, 2)$.

On separate diagrams in the space opposite, sketch the curve with equation

(a) $y = f(x + 1)$, **(3)**

(b) $y = f(2x)$. **(3)**

On each diagram, show clearly the coordinates of the maximum point, and of each point at which the curve crosses the coordinate axes.

A series of 25 horizontal dotted lines for writing.

7. Ahmed plans to save £250 in the year 2001, £300 in 2002, £350 in 2003, and so on until the year 2020. His planned savings form an arithmetic sequence with common difference £50.

(a) Find the amount he plans to save in the year 2011. (2)

(b) Calculate his total planned savings over the 20 year period from 2001 to 2020. (3)

Ben also plans to save money over the same 20 year period. He saves £ A in the year 2001 and his planned yearly savings form an arithmetic sequence with common difference £60.

Given that Ben's total planned savings over the 20 year period are equal to Ahmed's total planned savings over the same period,

(c) calculate the value of A . (4)

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8. Given that

$$x^2 + 10x + 36 \equiv (x + a)^2 + b,$$

where a and b are constants,

(a) find the value of a and the value of b . (3)

(b) Hence show that the equation $x^2 + 10x + 36 = 0$ has no real roots. (2)

The equation $x^2 + 10x + k = 0$ has equal roots.

(c) Find the value of k . (2)

(d) For this value of k , sketch the graph of $y = x^2 + 10x + k$, showing the coordinates of any points at which the graph meets the coordinate axes. (4)

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9. The curve C has equation $y = f(x)$ and the point $P(3, 5)$ lies on C .

Given that

$$f'(x) = 3x^2 - 8x + 6,$$

(a) find $f(x)$. **(4)**

(b) Verify that the point $(2, 0)$ lies on C . **(2)**

The point Q also lies on C , and the tangent to C at Q is parallel to the tangent to C at P .

(c) Find the x -coordinate of Q . **(5)**

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