

Two functions f and g are defined by $f(x) = 2x + 3$ and $g(x) = 2x - 3$, where x is a real number.

(a) Find expressions for:

(i) $f(g(x))$;

(ii) $g(f(x))$.

3

(b) Determine the least possible value of the product $f(g(x)) \times g(f(x))$.

2

It is claimed that a wheel is made from wood which is over 1000 years old.

To test this claim, carbon dating is used.

The formula $A(t) = A_0 e^{-0.000124t}$ is used to determine the age of the wood, where A_0 is the amount of carbon in any living tree, $A(t)$ is the amount of carbon in the wood being dated and t is the age of the wood in years.

For the wheel it was found that $A(t)$ was 88% of the amount of carbon in a living tree.

Is the claim true?

5

$f(x) = x^3 - x^2 - 5x - 3$.

What is the remainder when $f(x)$ is divided by $(x + 3)$?

A -24

B -3

C 36

D 48

(4) For what values of x is $6 + x - x^2 < 0$?

A $x > 3$ only

B $x < -2$ only

C $x < -2, x > 3$

D $-3 < x < 2$

(a) Express $2x^2 + 4x - 3$ in the form $a(x + b)^2 + c$.

3

(b) Write down the coordinates of the turning point on the parabola with equation $y = 2x^2 + 4x - 3$.

1

The diagram shows the graph of a function $y = f(x)$.

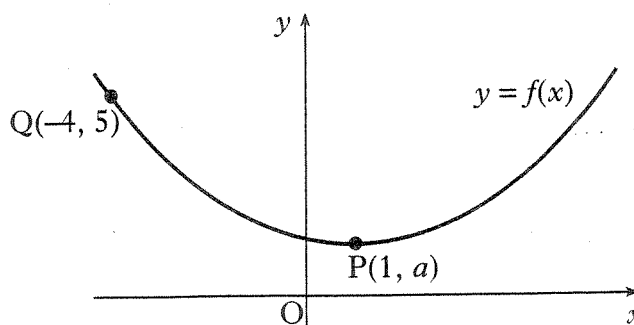
Copy the diagram and on it sketch the graphs of:

(a) $y = f(x - 4)$;

(b) $y = 2 + f(x - 4)$.

2

2



Find the value of k such that the equation $kx^2 + kx + 6 = 0$, $k \neq 0$, has equal roots.

4