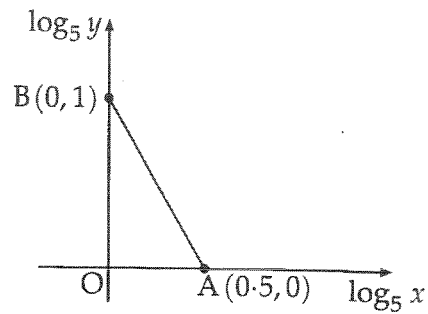
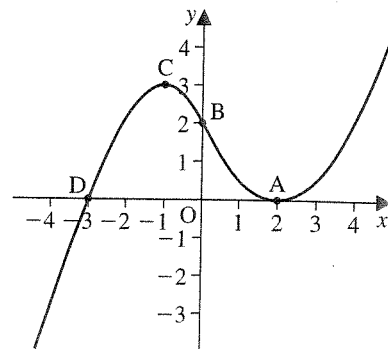


1. Solve the equation  $\log_x 8 + \log_x 4 = 5$ .

2. The graph illustrates the law  $y = kx^n$ .  
If the straight line passes through  $A(0.5, 0)$  and  $B(0, 1)$ , find the values of  $k$  and  $n$ .



3. Part of the graph of  $y = f(x)$  is shown in the diagram.  
On separate diagrams, sketch the graphs of  
(i)  $y = f(x - 1)$       (ii)  $y = -f(x) - 2$   
indicating on each graph the images of A, B, C and D.  
[Higher]



4. Given that  $k$  is a real number, show that the roots of the equation  $kx^2 + 3x + 3 = k$  are always real numbers.  
[Higher]

5. (a) Show that the function  $f(x) = 2x^2 + 8x - 3$  can be written in the form  $f(x) = a(x + b)^2 + c$  where  $a$ ,  $b$  and  $c$  are constants.  
(b) Hence, or otherwise, find the coordinates of the turning point of the function  $f$ .  
[Higher]

6. (a) The function  $f$  is defined by  $f(x) = x^3 - 2x^2 - 5x + 6$ .  
The function  $g$  is defined by  $g(x) = x - 1$ .  
Show that  $f(g(x)) = x^3 - 5x^2 + 2x + 8$ .  
(b) Factorise fully  $f(g(x))$ .  
(c) The function  $k$  is such that  $k(x) \doteq \frac{1}{f(g(x))}$ .  
For what values of  $x$  is the function  $k$  not defined?      [Higher]

7. Before a forest fire was brought under control, the spread of the fire was described by a law of the form  $A = A_0 e^{kt}$  where  $A_0$  is the area covered by the fire when it was first detected and  $A$  is the area covered by the fire  $t$  hours later.  
If it takes one and a half hours for the area of the forest fire to double, find the value of the constant  $k$ .

Calculator needed