Higher Maths
Unit 1 Specimen NAB
Number 1

Outcome 1

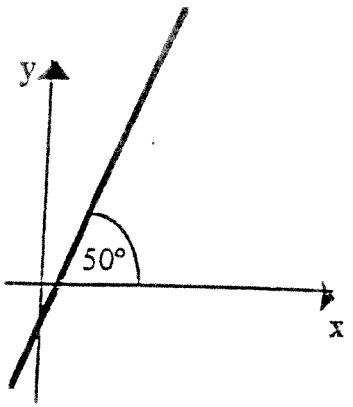
Marks

1. A line passes through the points (2, -1) and (-1, 5).
   Find the equation of this line. 2

2. A line makes an angle of 50^0 with the positive direction of the x-axis, as shown in the diagram.

   The scales on the axes are equal.

   Find the gradient of the line giving your answer correct to 3 significant figures. 2



3. A line L has equation $y = 2x - 3$
   Write down the gradient of a line which is:

   (a) parallel to L 1

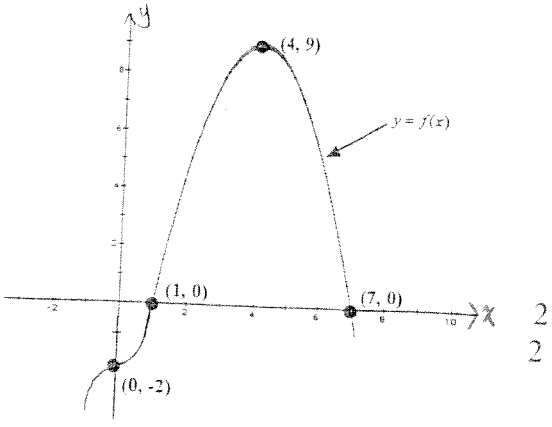
   (b) perpendicular to L 1

Outcome 2

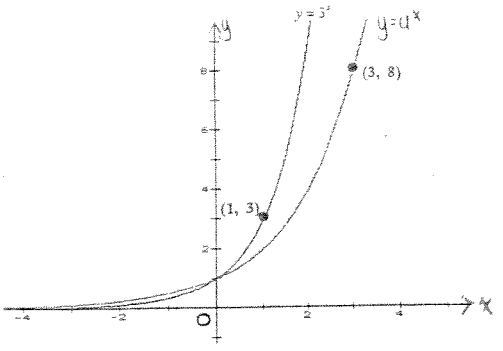
4. The graph of $y = f(x)$ is shown.

   On separate diagrams sketch the graphs of

   (a) $y = -f(x)$ 2
   (b) $y = f(x + 2)$ 2



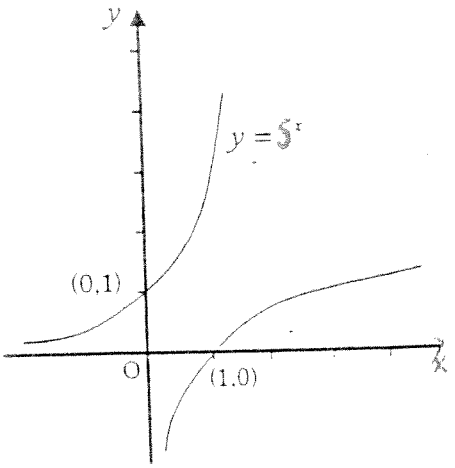
5. The graphs with equations $y = 3^x$ and $y = a^x$ are shown in the diagram.



If the graph of $y = a^x$ passes through the point (3 , 8), find the value of a.

1

6. The graphs of $y = 5^x$ and its inverse function are shown in the diagram.



Write down the equation of the inverse function.

1

7. Functions g and h are defined on suitable domains by $g(x) = \frac{1}{x}$ and $h(x) = 2x - 3$.

Obtain an expression for g(h(x)).

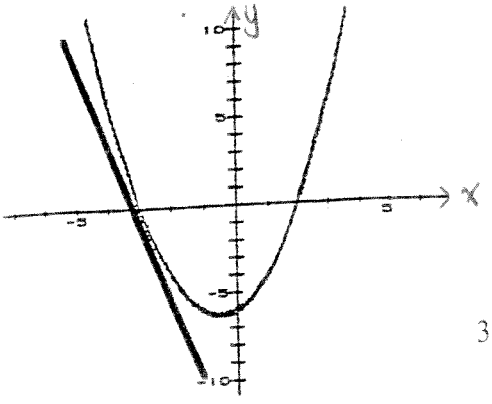
2

Outcome 3

8. Given that $y = \frac{8}{x^7}$, $x \neq 0$, find $\frac{dy}{dx}$.

2

9. A sketch of the curve with equation $y = x^2 + x - 6$ is shown in the diagram.



A tangent has been drawn at the point (-3, 0).

Find the gradient of the tangent.

3

10. A curve has equation $y = \frac{1}{3}x^3 + 2x^2 - 5x + 6$.

Using differentiation find the coordinates of the stationary points on this curve and determine their nature. 6

Outcome 4

11. Plants are treated weekly with the pesticide Slugstop. The producers claim that Slugstop will eliminate 80% of all pests. Between treatments, it is estimated that 500 new pests attack the plants.

There are u_n pests in the plants at the start of a particular week.

(a) Write down a recurrence relation for u_{n+1}, the number of pests in the plants at the start of the week. 1

(b) (i) Find the limit of the sequence generated by this recurrence relation as $n \to \infty$.

(ii) Explain what this limit means in the context of this problem. 3