

Higher Maths – Homework 6

1. $2x^2 - 12x - 5$ expressed in the form $a(x + b)^2 + c$ gives
A $2(x - 3)^2 - 14$ B $2(x - 6)^2 - 14$ C $2(x - 6)^2 - 23$ D $2(x - 3)^2 - 23$

2. A recurrence relation is defined as $u_{n+1} = au_n + b$. Given $u_1 = 6$, $u_2 = 16$ and $u_3 = 36$, a and b will be equal to
A $a = 2, b = 2$ B $a = 0.5, b = 2$ C $a = 0.5, b = 4$ D $a = 2, b = 4$

3. A triangle ABC has vertices A(-2,1), B(6,7) and C(10,-7). The median from B to the line AC will have gradient
A -5 B 5 C $\frac{1}{5}$ D $-\frac{1}{5}$

4. One of the roots of $x^3 - 2x^2 - px + 12 = 0$ is 4.
Calculate p and hence find the other roots of this polynomial.

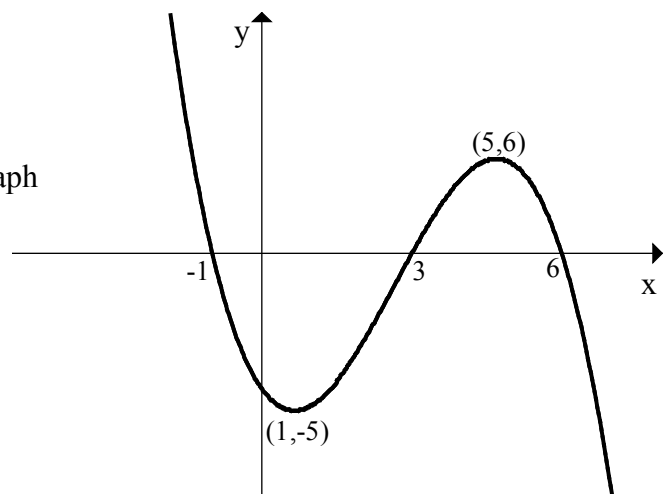
5. Find the equation of the tangent to the curve $y = x^3 - 5x + 3$ at the point where $x = 2$.

6. Solve the equation $4\sin^2 x - 3 = 0$, $0 \leq x \leq 360$.

7. $f(x) = x^2 + \frac{4x}{\sqrt{x}}$, find $f'(4)$.

8. The diagram opposite shows part of the graph of $y = f(x)$.

Sketch the graph of $y = 2 - f(x)$.



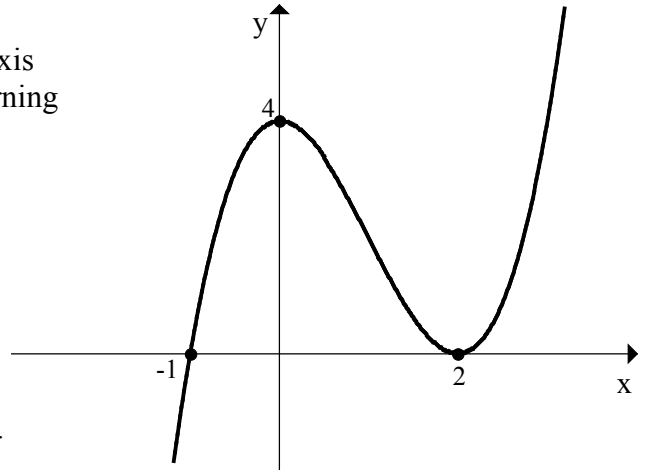
9. An endangered species of snake living on a small island off the coast of Africa is decreasing in numbers at a rate of 15% each year. Scientists are breeding snakes in an effort to rescue the species.
It is planned to release 180 snakes into the wild each year and scientists estimate that the safety of the species will be guaranteed if the population eventually settles at somewhere between 1000 and 1500.

- (a) Set up a recurrence relation to describe this situation.
(b) Will the safety of the population be guaranteed?

10. (a) The graph shown opposite crosses the x-axis at $(-1,0)$ and $(2,0)$ and has a maximum turning point of $(0,4)$.
Find the equation of this graph.

- (b) P is the point $(3,14)$ and Q is $(-1,-10)$.
Find the equation of the line PQ.

- (c) The line PQ intersects the graph in (a) at 3 points. If one of these points is $(4,20)$ find the other points of intersection.

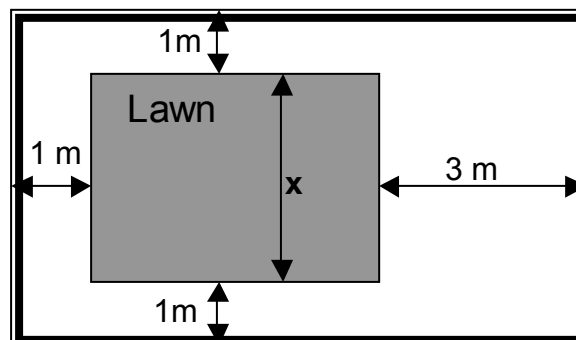


11. $f(x) = x^2 - 2$ and $g(x) = 2x + p$.

- (a) Show that $f(g(x)) - g(f(x)) = 2x^2 + 4px + p^2 - p + 2$.

- (b) Find p such that $f(g(x)) - g(f(x)) = 0$ has exactly one solution.

12. A rectangular garden has a rectangular lawn with an area of 50 m^2 , surrounded by a border as shown below.



- (a) The breadth of the lawn is x metres. Express the length of the lawn in terms of x .

- (b) Show that the total area of the garden can be written as $A = 58 + 4x + \frac{100}{x}$.

- (c) Find the dimensions of the garden so that the area is a minimum.