

Springburn Academy : Mathematics Department

Higher Mathematics : Lesson Starters

Block 1

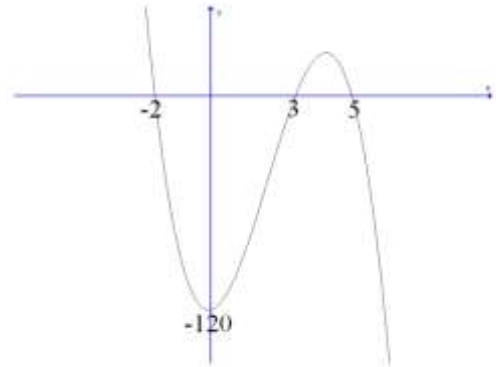
Without using a calculator:

Task 6

- 1 Given that $(x - 2)$ and $(x + 2)$ are both factors of $f(x) = x^3 + x^2 + px + q$, find the values of p and q . Hence, Solve $f(x) = 0$ for these values.
- 2 Does the line $y + 9x = 5$ intersect the parabola $y = 2x^2 - 4x$
- 3 $a = 5i - 2k$ and $b = -3j + 4k$, calculate $\left|2a - \frac{1}{2}b\right|$
- 4 Simplify $2\sqrt{2}(\sqrt{14} + 5\sqrt{2})$

Task 7

- 1 The graph of function $f(x)$ is shown below. Find $f(x)$



- 2 Given that $x = -1$ and $x = 2$ are roots of the equation $x^3 + ax^2 + 2x + b = 0$, establish the values of a and b and hence find the third root of the equation.
- 3 PQRS is a parallelogram as shown in the diagram.
 - (a) Show that the equation of QS is $x + 3y = 22$
 - (b) Hence find the coordinates of Q and R

Task 8

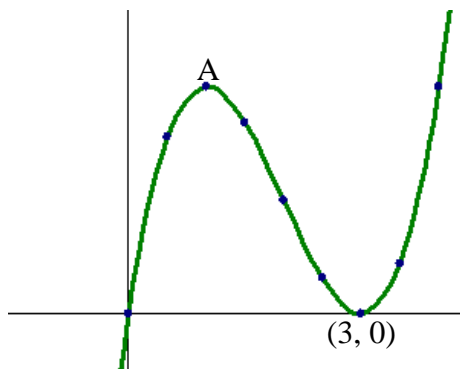
- 1 $f(x) = x^3 + nx + 48$. Find n given 2 is a solution to the equation $f(x) = 0$. Hence find the other solutions to $f(x) = 0$.
- 2 Show that there are two values of m for which $(x - m)^2 = 3x(2 - x)$ has equal roots
- 3 Express $5 - 8x - 2x^2$ in the form $a(x + b)^2 + c$.
- 4 Express with a rational denominator, in its simplest form $\frac{\sqrt{5}}{2\sqrt{30}}$

Task 9

- 1 Show that the line $y = 3x - 2$ and the curve $y = x^3 + 5x + 10$ intersect at the point $(-2, -8)$.
Prove that there are no other points of intersection between the curve and the line.

- 2 In the diagram A is the point $(1, 12)$.

Find the equation of $f(x)$.



- 3 Calculate the distance between $C(-5, 7)$ and $D(1, -3)$. Leave your answer as a surd, in its simplest form.
- 4 Factorise $x^4 - x^3 - 6x^2$ fully.

Task 10

- (a) Show that $x = -1$ is a solution of the cubic equation $x^3 + px^2 + px + 1 = 0$.
- (b) Hence find the range of values of p for which all the roots of the cubic equation are real.