

Springburn Academy : Mathematics Department

Higher Mathematics : Lesson Starters

Block 1 Polynomials

Without using a calculator:

Task 1

- 1 Find the remainder when the polynomial $2x^3 - x^2 - 5x - 1$ is divided by $(x - 2)$
- 2 The roots of the equation $\frac{p-1}{x} + \frac{x}{4} = 1$ are equal. Find p.
- 3 A triangle PQR is such that P is (1,1), Q is (-2,-4) and R is (11,-5).
Show that this triangle is right-angled at P.
- 4 Solve $16x^2 = 49$.

Task 2

- 1 Show that $(x - 3)$ is a factor of $x^3 - 8x^2 + x + 42$.
- 2 Solve $2x^2 - 6x + 4 > 3$
- 3 P is the point (-1,8,0) and Q is (4,-2,5). B divides PQ in the ratio 3:2.
Find the coordinates of B.
- 4 Find the equation of the perpendicular bisector of the line

Task 3

- 1 Show that 4 is a root of $2x^3 - 8x^2 - 8x + 32 = 0$ and hence find the other roots.
- 2 Show that the line $y = 10x - 2$ is a tangent to the curve $y = 2x(x + 3)$ and find the point of contact.
- 3 Find the range of values for k such that the equation $tx^2 - t - 1 = 0$ has no real roots.
- 4 A line has equation $4x + 3y - 4 = 0$. Find the gradient of the line perpendicular to this line.

Task 4

- 1 Show that $x = -3$ is a root of $x^3 - 19x = 30$. Hence solve $x^3 - 19x = 30$ completely.
- 2 Show that $(3x + 1)$ is a factor of $h(x) = 3x^3 + x^2 - 3x - 1$. Hence factorise $h(x)$ fully.
- 3 Calculate the length of the vector $\mathbf{u} = 3\mathbf{i} - 4\mathbf{j} + \mathbf{k}$
- 4 Find the value of $\sqrt[3]{1000^{-2}}$

Task 5

- 1 A function f is defined by the formula $f(x) = 2x^3 - 7x^2 + 9$ where x is a real number.
- 2
 - (a) Show that $(x - 3)$ is a factor of $f(x)$, and hence factorise $f(x)$ fully.
 - (b) Find the coordinates of the points where the curve with equation $y = f(x)$ crosses the x - and y -axes.