

# Springburn Academy : Mathematics Department

## Higher Mathematics : Lesson Starters

### Block 1 (Quadratics 2)

Without using a calculator:

#### Task 6

- 1 Find the value(s) of  $m$  such that the equation  $9m^2 + m - 1 = 2mx + 2x$  has equal roots
- 2 A(2,5), B(3,1) and C(6,6). Show that triangle ABC is isosceles.
- 3 Find the equation of the parabola which passes through the points (-5, 0), (0, 60) and (3, 0)
- 4 Simplify  $2w^5 \left( \frac{1}{w} + 4w^{-2} \right)$

#### Task 7

- 1 For what value of  $t$  does the equation  $2t^2 - 7t + t + 5 = 0$  have real roots
- 2 Express  $-3x^2 + 12x - 10$  in the form  $a(x+b)^2 + c$ . Hence, write down the coordinates of the turning point and state its nature.
- 3 A(-3, 4, 7), B(-1, 8, 3) and C(0, 10, 1) are collinear points. TRUE/FALSE
- 4 Write as a single fraction, in its simplest form  $\frac{3}{m^2} + \frac{1}{m^4}$

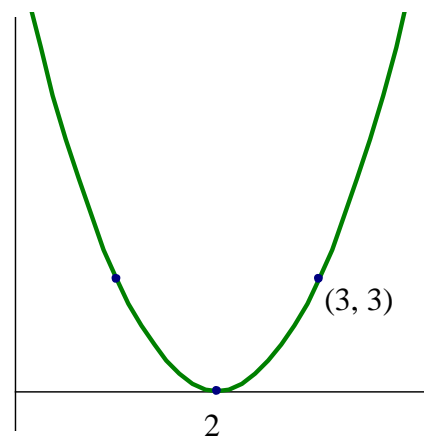
#### Task 8

- 1 Express  $y = 10 - 2x - x^2$  in the form  $y = a(x + b)^2 + c$ .

Hence sketch the graph of  $y$  showing clearly where it cuts the  $y$ -axis and its stationary point, stating whether it is a maximum or minimum.

- 2 Determine the equation of the function in the form

$$f(x) = ax^2 + bx + c$$



- 3 The gradient of AB is  $\frac{4}{3}$ . CD is parallel to AB. Calculate  $x$  if C(-1, 6) and D(3,  $x$ )
- 4  $P = \frac{c^2 - 5c}{6}$ . Find  $c$  given  $P = 4$

### Task 9

- 1 What is the equation of the line perpendicular to  $4x + 7y + 5 = 0$ , which passes through the point  $(5, -3)$ .
- 2 Show that the line  $y = 2x - 21$  is a tangent to the parabola  $y = x^2 - 10x + 15$  and find the point of contact.
- 3 Write  $2x^2 + 4x + 7$  in the form  $a(x+b)^2+c$ .
- 4 Simplify  $e^{-\frac{2}{3}}(e^{\frac{7}{3}} - 2e^{\frac{2}{3}})$

### Task 10

- 1 The line  $y = 4x - 1$  is a tangent to the curve  $y = 3x^2 - 11x + 5$ . TRUE/FALSE
- 2 The diagram shows a sketch of a parabola passing through  $(-1, 0)$ ,  $(0, p)$  and  $(p, 0)$ .
  - (a) Show that the equation of the parabola is  $y = p + (p - 1)x - x^2$ .
  - (b) For what value of  $p$  will the line  $y = x + p$  be a tangent to this curve?

