

Springburn Academy : Mathematics Department

Higher Mathematics : Lesson Starters

Block 1 (Differentiation 2)

Without using a calculator:

Task 6

1 $f(x) = \frac{8x - 2x^4}{x\sqrt{x}}$. Find $f'(x)$

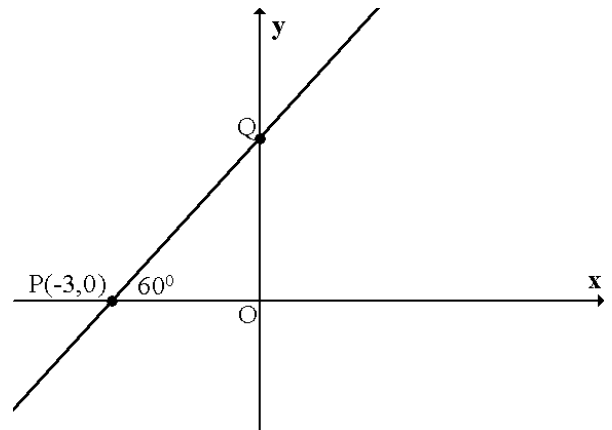
2 A curve has equation $y = x^2 + 9x + 4$. A tangent to this curve has gradient 5.

Find the equation of this tangent.

3 Find the equation of the line PQ where

P is the point $(-3, 0)$ and angle QPO is 60° .

4 Evaluate $32^{-3/5}$



Task 7

1 Show that the curve $y = x^3 - x^2 + x$ is always increasing.

2 A curve has equation $y = \frac{x^4}{4} - 32x$. A tangent to this curve is parallel to the x-axis.

Find the equation of this tangent.

3 $f(x) = x^3 - 2x^2 + 4$. If $f'(x) = 7$, find x .

4 What is the gradient of the line parallel to $2y - 3x + 8 = 0$?

Task 8

1 $y = \frac{x^2 - x}{\sqrt[4]{x^3}}$. Find $\frac{dy}{dx}$ when $x = 16$.

2 Show that the curve $y = 12x^2 - 6x - 8x^3$ is never increasing.

3 Find the range of values of k such that the equation $\frac{(x-2)^2}{x^2 + 2} = k$ has real roots.

4 The line $3y - x + 5 = 0$ is perpendicular to the line $2y - 6x = -1$. TRUE/FALSE?

Task 9

- 1 $y = x^2 + 12\sqrt{x} + 7$. Calculate the gradient of this curve when $x = 9$
- 2 Find the coordinates of the turning points of the curve with equation $y = x^3 - 3x + 2$ and determine their nature.
- 3 E(-1, -1, 4), P(1, 5, 7) and F(7, 17, 13) are three collinear points. P lies between E and F. What is the ratio in which P divides EF?

Task 10 A curve has equation

$$f(x) = x^4 - 8x^3.$$

- (a) Find the coordinates of the points where this curve cuts the x-axis.
- (b) Find the coordinates of the stationary points of this curve and determine their nature.
- (c) Hence sketch the graph of $f(x) = x^4 - 8x^3$.