Differentiation powers of *x* / gradient

1Q

Given that $y = x^3 + 6x^2 + 15x + 7$ find $\frac{dy}{dx}$. Use your results to show that the graph of $y = x^3 + 6x^2 + 15x + 7$ has no turning points. [4]

2Q

Find the co-ordinates of the points on the graph of $y = 2x^3 + 3x^2 - 36x - 12$, where the gradient is equal to 0. [4]

3Q

Given that $y = x^3 + 3x^2 + 21x - 9$ find $\frac{dy}{dx}$. Use your results to show that the graph of $y = x^3 + 3x^2 + 21x - 9$ has no turning points. [4]

4Q

Given that $y = (x^2 - 5)(x + 3)$ find $\frac{dy}{dx}$. Hence find the co-ordinates of the points on the curve where the gradient is equal to 4. [6]

5Q

Given that $y = 3x^2 + 2x + 7$ find $\frac{dy}{dx}$. At what point on the curve is the gradient of the tangent parallel to the line $y = 24 - 10x$? [4]

6Q

Find the co-ordinates of the points on the curve, $y = x^3 - 6x^2 + 3x - 10$, where the tangents are perpendicular to the line $x + 18y = 7$. [6]

7Q

Given that $y = x^3 - 9x^2 - 24x + 12$, find $\frac{dy}{dx}$. [2]

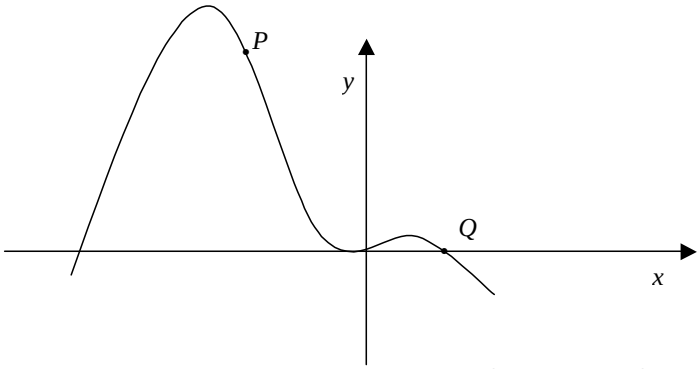
P is the point on the curve where $x = -2$.

(a) Calculate the *y* co-ordinate of *P*. [2]

(b) Calculate the gradient of the curve at *P*. [2]

(c) Find the values of *x* for which the curve has a gradient of −3. [2]

8Q



The diagram shows the curve with equation $y = x^2(3 - 2x - x^2)$. P and Q are points on the curve with co-ordinates (–2, 12) and (1, 0) respectively.

(a) Find $\frac{dy}{dx}$. [2]

(b) Find the equation of the line PQ. [3]

(c) Prove that the line PQ is a tangent to the curve at both P and Q. [4]

9Q

Find the co-ordinates of the points on the curve $y = x^3 - 6x^2 + 21x - 15$, where the tangents are perpendicular to the straight line with gradient $-\frac{1}{12}$. [5]

10Q

The gradient of a curve is given by $\frac{dy}{dx} = 3x^2 - 8x + 5$. The curve passes through the point (3, –1).

(a) Find the equation of the curve. [2]

(b) Find the co-ordinates of the point where the gradient of the curve is equal to 1. [4]