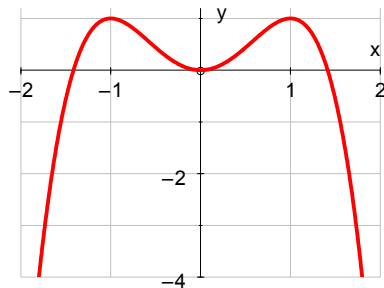# Edexcel AS Mathematics Differentiation

Section 2: Maximum and minimum points

Exercise level 2

1. Find the range of values of x for which $f(x) = x^3 + x^2 - x + 3$ is an increasing function.

2. Find the range of values of x for which $f(x) = x^3 - 6x^2 + 9x + 5$ is a decreasing function.

3. Copy the curve shown below, and sketch the shape of the derivative on the same axes.

4. The equation of a curve is given by $y = 2x + x^2 - 4x^3$.
   (i) Find the coordinates of the turning points on the curve, and distinguish between them by considering the gradient on either side of the turning points.
   (ii) Sketch the curve marking the turning points and points of intersection with the axes clearly.

5. The curve $y = x^3 + px^2 + q$ has a minimum point at (4, -11). Find the coordinates of the maximum point on the curve.

6. The curve $y = x^3 + ax^2 + bx + c$ passes through the point (1, 1).
   (i) Write down and simplify an equation connecting a, b and c.

   The curve also has turning points when $x = -1$ and when $x = 3$.

   (ii) Find two further equations connecting a, b and c.
   (iii) Solve the three equations simultaneously to obtain values for a, b and c.