## Section 1: Introduction to differentiation

### Exercise level 1

1.  Differentiate with respect to $x$:
    (i) $f(x) = 2x + 1$   (ii) $f(x) = x^3 - 5x$   (iii) $f(x) = x(x + 2)$.

2.  For the curve $y = 2x^3 - 3x^2 + x$
    (i) Find $\dfrac{dy}{dx}$
    (ii) Find the gradient of the curve at the point where $x = -2$.

3.  Given that $y = 12x - x^3$,
    (i)   Find the gradient of the curve at the origin.
    (ii)  Find the coordinates of the two points where the gradient is zero.

4.  Find the equation of the tangent to the curve $y = x^4 - x + 1$ at the point with $x$–coordinate 1.

5.  (i) Show that the equation of the normal to the curve $y = x^2 - x$ at the point (3, 6) is $x + 5y = 33$.
    (ii) Find the coordinates of the point where the normal meets the $x$–axis.