

1. Differentiate the following functions with respect to  $x$ :
- (a)  $y = 3x^9 - 2x^8 + 7$       (b)  $y = \frac{1}{x^7}$       (c)  $y = 4\sqrt{x}$
- (d)  $y = \frac{4}{\sqrt[3]{x}}$       (e)  $y = (4x + 3)^5$       (f)  $y = (x^3 - 5)^7$
- (g)  $y = \sqrt{16 - x^2}$       (h)  $y = \frac{1}{(2x + 3)^6}$       (i)  $y = (x - 2)(x + 7)$
- (j)  $y = x(x^2 - 1)^5$       (k)  $y = (x - 1)^2(x + 2)^3$       (l)  $y = \frac{2x + 9}{3x - 4}$
2. (a) Given that  $f(x) = 4x^2$ , find the value of  $f'(2)$ .
- (b) If  $G(x) = 1 - x^3$ , evaluate  $G'(-1)$ .
3. Given that  $p = 4q^2 - 9$  find  $\frac{dp}{dq}$ .
4. Find the equation of the tangent to the curve  $y = x^2 + 3x$  at the point where  $x = 3$ .
5. Find the equation of the normal to the curve  $f(x) = 3 - x^3$  at the point  $(-1, 2)$ .
6. (a) Differentiate  $f(x) = x^2 - 6x + 5$ .
- (b) Hence find the point on the curve where the gradient of the tangent is 0.
7. (a) Find the point of the intersection of the parabolas  $y = x^2 - 9$  and  $y = x^2 - 8x + 15$ .
- (b) Find the gradient of the tangents to the curves at this point.
- (c) Find the acute angle between the curves at this point
8. The gradient of a tangent to the curve  $y = x^2 - 5x$  is  $-3$ . Find the point of contact.