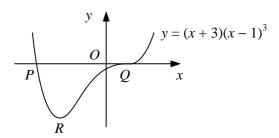
- A curve has the equation  $y = x^2(2-x)^3$  and passes through the point A (1, 1).
  - **a** Find an equation for the tangent to the curve at A.
  - **b** Show that the normal to the curve at A passes through the origin.
- 2 A curve has the equation  $y = \frac{x}{2x+3}$ .
  - a Find an equation for the tangent to the curve at the point P(-1, -1).
  - **b** Find an equation for the normal to the curve at the origin, O.
  - **c** Find the coordinates of the point where the tangent to the curve at *P* meets the normal to the curve at *O*.

3



The diagram shows the curve with equation  $y = (x + 3)(x - 1)^3$  which crosses the x-axis at the points P and Q and has a minimum at the point R.

- **a** Write down the coordinates of P and Q.
- **b** Find the coordinates of *R*.
- 4 Given that  $y = x\sqrt{4x+1}$ ,
  - **a** show that  $\frac{dy}{dx} = \frac{6x+1}{\sqrt{4x+1}}$ ,
  - **b** solve the equation  $\frac{dy}{dx} 5y = 0$ .
- A curve has the equation  $y = \frac{2(x-1)}{x^2+3}$  and crosses the x-axis at the point A.
  - a Show that the normal to the curve at A has the equation y = 2 2x.
  - **b** Find the coordinates of any stationary points on the curve.

6

$$f(x) \equiv x^{\frac{3}{2}} (x-3)^3, \ x > 0.$$

**a** Show that

$$f'(x) = k x^{\frac{1}{2}} (x-1)(x-3)^2$$
,

where k is a constant to be found.

**b** Hence, find the coordinates of the stationary points of the curve y = f(x).

7  $f(x) = x\sqrt{2x+12}, x \ge -6.$ 

- **a** Find f'(x) and show that  $f''(x) = \frac{3(x+8)}{(2x+12)^{\frac{3}{2}}}$ .
- **b** Find the coordinates of the turning point of the curve y = f(x) and determine its nature.