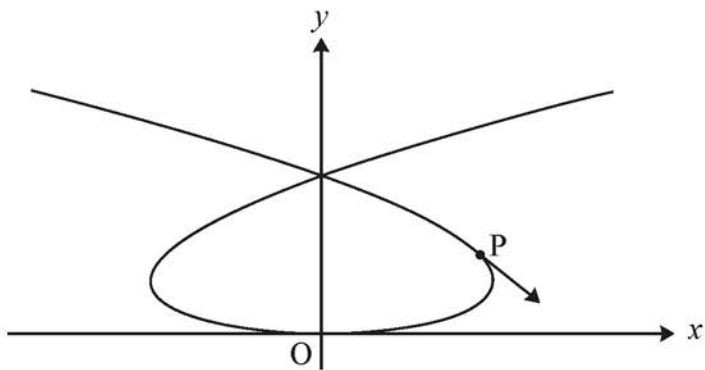


- 8 A particle moves in the  $x$ - $y$  plane so that its position at time  $t$  s is given by  $x = t^3 - 8t$ ,  $y = t^2$  for  $-3.5 < t < 3.5$ . The units of distance are metres. The graph shows the path of the particle and the direction of travel at the point P (8, 4).



- (a) Find  $\frac{dy}{dx}$  in terms of  $t$ . [3]
- (b) Hence show that the value of  $\frac{dy}{dx}$  at P is  $-1$ . [2]
- (c) Find the time at which the particle is travelling in the direction opposite to that at P. [2]
- (d) Find the cartesian equation of the path, giving  $x^2$  as a function of  $y$ . [3]