

- 12 Below is a faulty argument that appears to show that the gradient of the curve $y = x^2$ at the point $(3, 9)$ is 1.

Consider the chord joining $(3, 9)$ to the point $(3+h, (3+h)^2)$

The gradient is $\frac{(3+h)^2 - 9}{h} = \frac{6h+h^2}{h}$

When $h = 0$ the gradient is $\frac{0}{0}$ so the gradient of the curve is 1

- (a) Identify a fault in the argument. [1]
- (b) Write a valid first principles argument leading to the correct value for the gradient at $(3, 9)$. [3]
- (c) Find the equation of the normal to the curve at the point $(3, 9)$. [2]