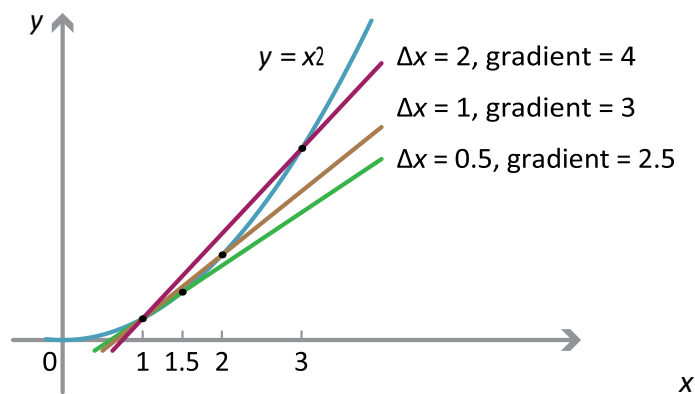## Calculating the gradient of $y=x^2$

Let us consider a specific function $f(x) = x^2$ and its graph $y = f(x)$, which is the standard parabola. To illustrate the ideas in the previous section, we will calculate the gradient of this curve at $x = 1$.

We first construct secant lines between the points on the graph at $x = 1$ and $x = 1+\Delta x$, and calculate their gradients.

Gradients of secants from $x = 1$ to $x = 1+\Delta x$.

For instance, taking $\Delta x = 2$, we consider the secant connecting the points at $x = 1$ and $x = 3$.

Between these two points, $f(x)$ increases from $f(1) = 1$ to $f(3) = 9$, giving $\Delta y = 8$, and hence

$$\frac{dy}{dx} = \frac{8}{2} = 4.$$