Exercise 1

For the following exercises, points $P(1, 2)$ and $Q(x, y)$ are on the graph of the function $f(x) = x^2 + 1$.

Complete the following table with the appropriate values: y-coordinate of Q, the point $Q(x, y)$, and the slope of the secant line passing through points P and Q. Round your answer to eight significant digits.

x	y	$Q\,(x, y)$	m_{sec}
1.1	a.	e.	i.
1.01	b.	f.	j.
1.001	c.	g.	k.
1.0001	d.	h.	l.

Solution

If $x = 1.1$, then $y = (1.1)^2 + 1 = 2.21$, which means $Q(1.1, 2.21)$ and

$$m_{\text{sec}} = \frac{2.21 - 2}{1.1 - 1} = 2.1.$$

If $x = 1.01$, then $y = (1.01)^2 + 1 = 2.0201$, which means $Q(1.01, 2.0201)$ and

$$m_{\text{sec}} = \frac{2.0201 - 2}{1.01 - 1} = 2.01.$$

If $x = 1.001$, then $y = (1.001)^2 + 1 = 2.002001$, which means $Q(1.001, 2.002001)$ and

$$m_{\text{sec}} = \frac{2.002001 - 2}{1.001 - 1} = 2.001.$$

If $x = 1.0001$, then $y = (1.0001)^2 + 1 = 2.00020001$, which means $Q(1.0001, 2.00020001)$ and

$$m_{\text{sec}} = \frac{2.00020001 - 2}{1.0001 - 1} = 2.0001.$$

For $f(x) = x^2 + 1$, the slope of the secant line passing through P and Q gets closer and closer to 2 as x gets closer and closer to 1.