Worksheet

The limit

In mathematics, when we talk about a limit we are asking: "What is the output approaching as we approach a specific input?" For example, looking at the parabola $y = x^2$ it is clear that as we get closer to the x-value of 2, the output will get closer to 4.
Mathematically, we say that the limit of $f(x) = x^2$ is equal to 4 as x moves to 2.
We write this as:

$\lim_{x \to 2} x^2 = 4$

The derivative

The slope of the tangent at the point $(x, f(x))$ on the graph of f is called the derivative of f at x and is written $f'(x)$.

Concavity

A function is concave up if it 'opens' up, and the function is concave down if it 'opens' down. Concavity has nothing to do with increasing or decreasing. A function can be concave up and either increasing or decreasing. Similarly, a function can be concave down and either increasing or decreasing.

The limit

In general, we obtain the following rules for limits:

- $\lim_{x \to a} f(x) = f(a)$
- $\lim_{x \to a} k = k$ where k is a constant.

Exercise 1

1. Calculate the limit of each of the following:

1.1 $\lim_{x \to 2} (x + 2)$

1.2 $\lim_{x \to 1} \frac{x - 1}{x^2 - 1}$

1.3 $\lim_{x \to 0^+} \frac{1}{x}$

1.4 $\lim_{x \to 0^-} \frac{1}{x}$

1.5 $\lim_{x \to \infty} \frac{1}{x - 1}$

1.6 $\lim_{x \to 10} 11$