1. Limits are important to cope with $0/0$.
2. We see $0/0$ when computing instantaneous rates of change.
3. To estimate $\lim_{x\to a} f(x)$ you can substitute values of x close to a into f.
4. We also use limits to investigate 1/0 expressions, and when the limit exists the answer is typically $\pm\infty$.
5. 1/0 expressions often have different one-sided limits, $+\infty$ on one side and $-\infty$ on the other.

1. Estimate

$$\lim_{h\to 0} \frac{\sqrt{2+h}-\sqrt{2}}{h}$$

to 5 decimal digits.

2. Estimate

$$\lim_{x\to 0} \frac{x^2}{\cos(x)-1}$$

to 5 decimal digits.

3. Sketch the graph of

$$f(x) = \frac{1}{(3-x)^2}.$$

Then determine

$$\lim_{x\to 3} f(x).$$

4. Determine

$$\lim_{x\to 3^+} \frac{1}{3-x}$$

and

$$\lim_{x\to 3^-} \frac{1}{3-x}.$$

A sketch of the graph might be helpful.

5. Determine the left- and right-hand limits at 0 of $f(x) = x/|x|$.

6. Suppose

$$g(x) = \begin{cases} x^2 + 1 & x \geq -1 \\ 2 - x & x < -1. \end{cases}$$

Sketch the graph. Then determine if $\lim_{x \to -1} g(x)$ exists. If not, determine if the left- and right-hand limits exist.

7. Determine exactly

$$\lim_{x\to 2} \frac{x^2 - 7x + 10}{x - 2}$$

8. Determine

$$\lim_{x\to 0^+} 10^{-\frac{1}{x}}$$

and

$$\lim_{x\to 0^-} 10^{-\frac{1}{x}}.$$