1. Continuous at $x = a$: $\lim_{x \to a} f(x) = f(a)$

2. A continuous function is continuous at each point in its domain.

3. If left and right limits disagree, then a limit does not exist.

4. Intermediate Value Theorem (one version): If a **continuous** function on $[a, b]$ is positive at a and negative at b, then it is zero somewhere in the middle.

1. Show that there is a number x such that

$$10^x = x^2.$$

2. True or false: taxi fare is a continuous function of distance traveled. Justify your answer. You may assume this generous taxi does not charge for waiting time.

3. Consider the function

$$f(x) = \begin{cases} \cos(x) & x > 0 \\ -x^2 & x \le 0 \end{cases}$$

a) Sketch $f(x)$.

b) Compute $\lim_{x \to 0^+} f(x)$.

c) Compute $\lim_{x \to 0^-} f(x)$.

d) Is $f(x)$ continuous at $x = 0$? Justify your answer.

4. Consider the function
$$f(x) = \frac{\tan(3x)}{x}$$

a) What is the value of $f(0)$?

b) Using a calculator, estimate $\lim_{x \to 0} \tan(3x)/x$. Be sure to put your calculator in radians mode!

c) For what value of a is
$$g(x) = \begin{cases} \tan(3x)/x & x \neq 0 \\ a & x = 0 \end{cases}$$
continuous at $x = 0$?