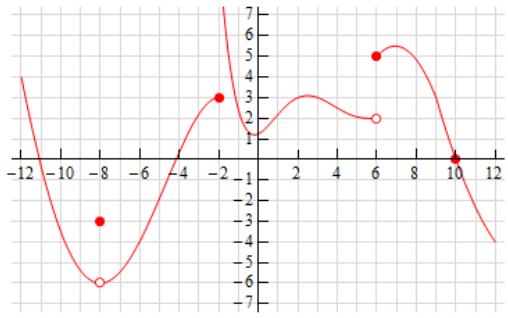
Week 4 Recitation Problems

MATH:113, Recitations 304 and 305

Determine whether these functions are continuous at the indicated points.

$$g(x) = \begin{cases} 2x & x < 6 \\ x - 1 & x \geq 6 \end{cases}$$

$$x = 4,\ x = 6$$



$$f(x) = \frac{6}{x^2 - 3x - 10}$$

$$x = -2,\ x = 0,\ x = 3$$

$$f(t) = \begin{cases} t^2 & t < -2 \\ t + 6 & t \geq -2 \end{cases}$$

$$t = -2,\ t = 10$$

$$f(x) = \begin{cases} x^2 & x < 0 \\ e^x & x \geq 0 \end{cases}$$

$$x = 0$$

(How can we make this function continuous?)

$$h(x) = \frac{5x + 5}{9 - 3x}$$

$$x = -1,\ x = 0,\ x = 3$$

. . . . . .

What are the domains and ranges of these functions? Where are they discontinuous?

$$f(x) = \frac{x^2 - 9}{3x^2 + 2x - 8}$$

$$r(\theta) = \tan(2\theta)$$

$$H(t) = \frac{8t}{t^2 - 9t - 1}$$

$$L(t) = \sin\left(\frac{1}{t}\right)$$

$$y(t) = \frac{t}{7 - e^{2t+3}}$$

$$f(x) = \frac{\sin x}{x - 2}$$

Solve two of these problems using the intermediate value theorem.

(a) Show that the function $f(x) = x^4 + x - 3$ has a root on the interval $[0, 2]$.

(b) Does the function $g(x) = x^3 + 3x^2 + x - 2$ have a root in $[0, 1]$? If so, approximate it.

(c) Show that there exists a positive number c such that $c^2 = 2$.

. . . . . .

Derivatives.

Definition 1: the limit definition of a derivative.

Definition 2: the derivative of a function, using only words.

Find derivatives for these functions. Find the *value* of the derivative at $x = 0$.

$f(x) = |x|$

$g(x) = x^2$

$V(x) = 3 - 14x$

$L(x) = \dfrac{x^2 - 4}{x - 2}$

$h(x) = \dfrac{5}{x}$

$y(x) = x^{1/3}$