<u>Homework for Test #1</u>:

HW #1 (submitted 11/7):
- 1.2 #1-7odd,9-18all

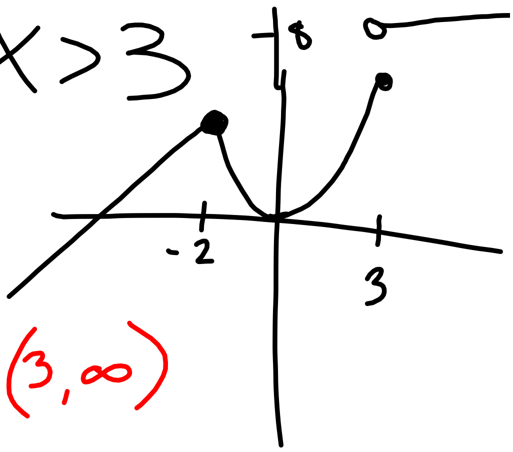
HW #2 (submitted 11/14):
- 1.2 #23, 25, 27, 29, 30, 31 epsilon delta
  (and watch all of the Khan Academy epsilon-delta videos!)
- 1.3 #11,17,27-35odd, 39-61odd evaluating limits analytically
  1.3 #67-77odd; 87, 88 limits with trig, squeeze theorem
  *problems in red are NOT listed on syllabus
- 1.4 #7-17odd; limits of functions with discontinuities
  1.4 #25-28all; 39-47odd; discuss (dis)continuity

HW #3 (due Wed. 11/19)
- 1.4 #19,21,23,51,57,59,63,69,71 misc. continuity problems
  1.4 #83,85 intermediate value theorem
- 1.5 #1-51odd infinite limits
- Ch 1 review pp. 88-89
- Test #1 Practice Problems (handout; not listed on your syllabus!)

<u>HW #4</u> (not due until after the test, but will still help you with limits that will be on the test)
- 2.1 -#1-23odd derivative definition

- **Quiz #1** - Monday 11/17
- **Test #1** - Wednesday, 11/19

$$f(x) = \begin{cases} x+6, & x \le -2 \\ x^2, & -2 < x \le 3 \\ 8 & x > 3 \end{cases}$$



$-2+6 = 4$ $\quad$ $3^2 = 9$

$(-2)^2 = 4$ $\quad$ $8 = 8$

jump discontinuity @ $x = 3$

$f(x)$ is continuous $(-\infty, 3] \cup (3, \infty)$

$$f(x) = \begin{cases} \dfrac{|x-3|}{3-x}, & |x-3|>5 \\ x^2-3, & -2 \le x \le 8 \end{cases}$$

great OR $\cup$

lessthAND $\cap$

$|x-3| > 5$

$x-3>5$ or $x-3<-5$

$x>8$ or $x<-2$

$$\frac{|x-3|}{3-x} = \begin{cases} \dfrac{x-3}{3-x} = -1, & x>3 \quad (x-3>0) \\ \dfrac{-(x-3)}{3-x} = 1, & x<3 \quad (x-3<0) \end{cases}$$

$$f(x) = \begin{cases} \dfrac{|x-3|}{3-x}, & x<-2 \\ x^2-3, & -2 \le x \le 8 \\ \dfrac{|x-3|}{3-x}, & x>8 \end{cases} = \begin{cases} 1, & x<-2 \\ x^2-3, & -2 \le x \le 8 \\ -1, & x>8 \end{cases}$$

$(-2)^2-3 = 4-3 = 1$

$8^2-3 = 64-3 = 61$

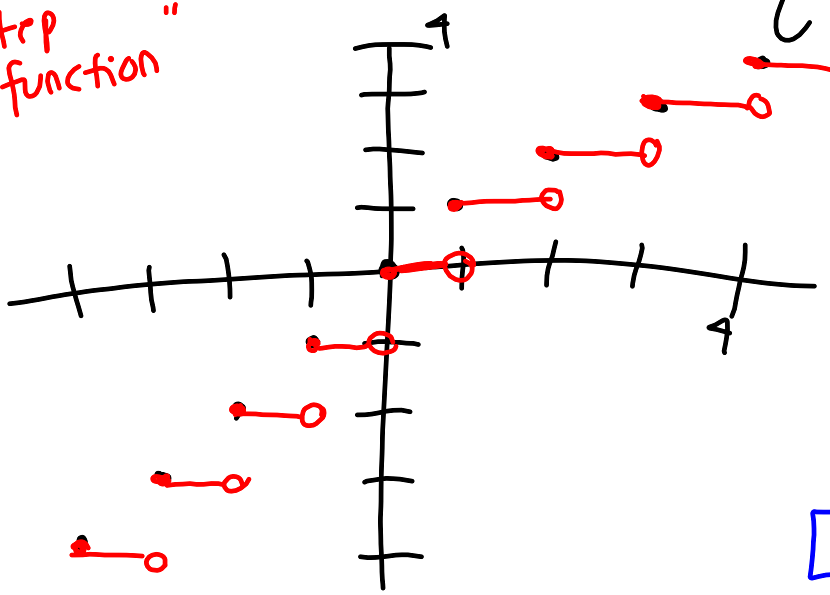
nonremovable (jump) discontinuity @ $x=8$

$\therefore$ $f(x)$ is continuous on $(-\infty, 8] \cup (8, \infty)$

The Greatest Integer Function

$[\![x]\!]$ = the greatest integer less than or equal to x

"step function"



jump discontinuities @ every integer

continuous on intervals of the form

$[k, k+1)$, $k \in \mathbb{Z}$

22. $\lim_{x \to 2^+} 2x - [\![x]\!]$

$= \lim_{x \to 2^+} (2x) - \lim_{x \to 2^+} [\![x]\!]$

$= 4 - 2$

$= \boxed{2}$

24. $\lim_{x \to 1} \left(1 - [\![-\frac{x}{2}]\!]\right)$

$= \lim_{x \to 1} 1 - \lim_{x \to 1} [\![-\frac{x}{2}]\!]$

$= 1 - (-1)$

$= \boxed{2}$

$x = 0.9$

$-\frac{0.9}{2} = -0.45$

$x = 1.1$

$-\frac{1.1}{2} = -0.55$

20. $\lim_{x \to \frac{\pi}{2}} \sec x$ = does not exist

$= \lim_{x \to \frac{\pi}{2}} \frac{1}{\cos x}$

$= \frac{\lim_{x \to \frac{\pi}{2}} 1}{\lim_{x \to \frac{\pi}{2}} \cos x}$

$\lim_{x \to \frac{\pi}{2}^-} \sec x = \infty$

$\lim_{x \to \frac{\pi}{2}^+} \sec x = -\infty$

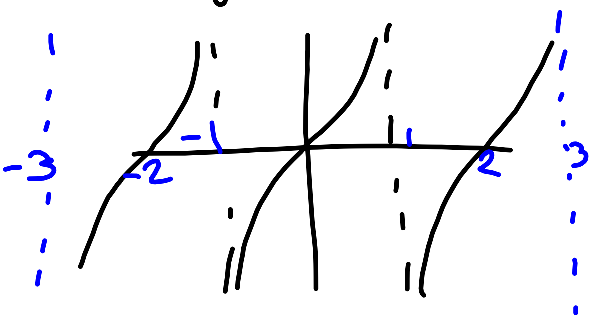
52. $f(x) = \tan \frac{\pi x}{2}$

discuss the (dis) continuity

period = $\frac{\text{original period}}{\text{x-coeff}}$

$= \frac{\pi}{\pi/2} = \pi \cdot \frac{2}{\pi} = 2$

$f(x) = \tan\left[\frac{\pi}{2} \cdot x\right]$



non-removable discontinuities @ every odd integer

continuous on all intervals of the form $(2k-1, 2k+1)$, $k \in \mathbb{Z}$

62. $f(x)=\frac{1}{\sqrt{x}}$, $g(x)=x-1$

$x>0$ g is continuous on $(-\infty,\infty)$

f is continuous on $(0,\infty)$

Discuss the continuity of $f(g(x))$.

$f(g(x))=\frac{1}{\sqrt{x-1}}$ $x-1>0$

$x>1$

$f(g(x))$ is continuous on $(1,\infty)$

(its domain)

64. $f(x)=\sin x$; $g(x)=x^2$

discuss the continuity of $f(g(x))$

continuous on

$(-\infty,\infty)$

$f(g(x))=\sin(x^2)$