This week's Assignments:

01: **Read** sections 1.3 and 1.4 in your textbook by Monday, 22 Aug.

02: Complete at least 45 minutes of exercises on **Khan Academy** on topics related to sections 1.3 and 1.4 by Friday, 26 Aug. In addition, complete "Mastery Challenges" as often as they become available to you.

03: **Textbook exercises**, mostly be completed in class and will be due Friday, 26 Aug.

- 1.3 #11,21,27-39 odd, 41-61 odd; 83, 87 — evaluating limits analytically
- 1.3 #63-73 odd; 89, 90 — limits with trig, squeeze theorem

Expect another quiz before the test!

Test #1 - Next Friday, 2 Sept

Next week's assignments:

01: Read 1.4-1.5

02: 45 minutes of Khan Academy

03: Textbook exercises:

- 1.4 #1-19 odd; — limits of functions with discontinuities
- 1.4 #27-30 all; 43-48 all; — discuss (dis)continuity
- 1.4 #21,23,25,57,61,65,69,99,102 — misc. continuity problems
- 1.4 #87-98 all — Intermediate Value Theorem
- 1.5 #1,3,23,29-57 odd — Infinite Limits
- Ch 5 Review pp. 91-92 #3-83 odd — Review

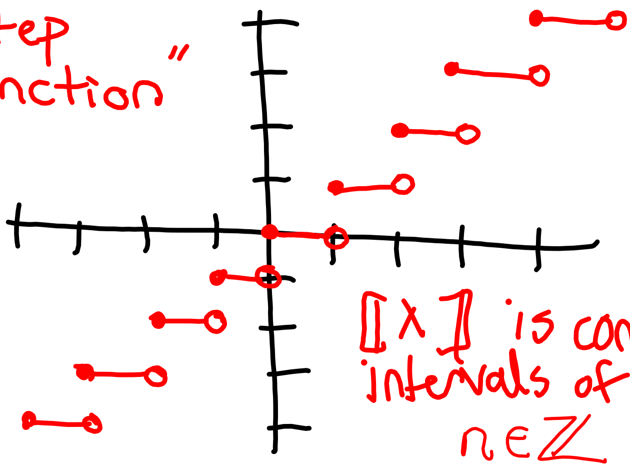
Discuss the [dis]continuity of the function.

The Greatest Integer Function

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

"step function"

$\lfloor x \rfloor$



$[\![x]\!]$ has non-removable jump discontinuities @ all integers

$[\![x]\!]$ is continuous on all intervals of the form $[n, n+1)$ $n \in \mathbb{Z}$

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

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

$= 2(2) - 2$

$= \boxed{2}$

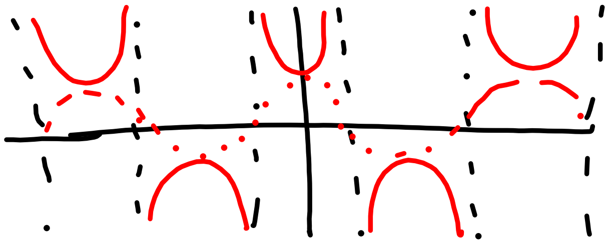
24. $\lim_{x\to 1}\left(1 - [\![-\frac{x}{2}]\!]\right)$

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

$= 1 - (-1)$

$= \boxed{2}$

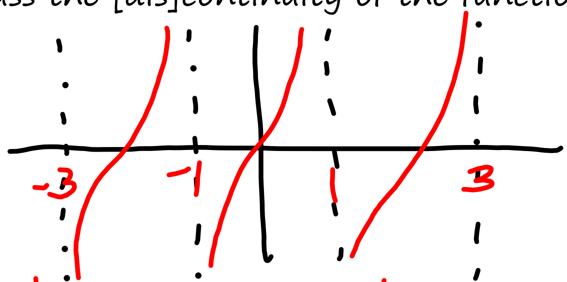
20. $\lim_{x \to \frac{\pi}{2}} \sec x$



$\boxed{\text{does not exist}}$

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

Discuss the [dis]continuity of the function.



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

f has non-removable discontinuities at $x = 2n+1$ $n \in \mathbb{Z}$

f is continuous on all intervals of the form $(2n-1, 2n+1)$

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

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

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

is continuous on its domain

$(1,\infty)$

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

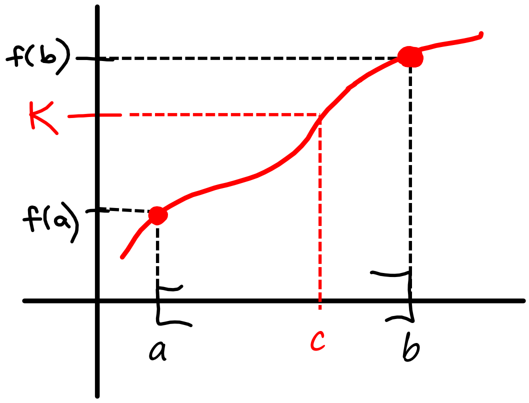
Discuss the continuity of f(g(x)).

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

is continuous on $(-\infty,\infty)$

Intermediate Value Theorem

If f is continuous on the closed interval $[a,b]$ and k is any number between $f(a)$ and $f(b)$, then there is at least one number c in $[a,b]$ such that $f(c)=k$.



Does the IVT guarantee a zero in the given interval?

76. $f(x)=x^3+3x-2$, $[0,1]$

$f(0)=-2<0$

$f(1)=2>0$

IVT guarantees a zero in $[0,1]$

To find it, set $x^3+3x-2=0$ & solve for x

84. $f(x) = x^2 - 6x + 8$; $[0,3]$ $\quad f(c) = 0$

$f(0) = 8 > 0$

$f(3) = 3^2 - 6(3) + 8 = -1 < 0$

} IVT guarantees a $c \in [0,3]$ s.t. $f(c) = 0$

To find it, set $x^2 - 6x + 8 = 0$

$(x-4)(x-2) = 0$

$4 \notin [0,3] \longrightarrow \cancel{x=4}$, $\boxed{x=2}$

86. $f(x) = \dfrac{x^2+x}{x-1}$, $\left[\frac{5}{2}, 4\right]$, $f(c) = 6$

$f\left(\frac{5}{2}\right) = \dfrac{\left(\frac{5}{2}\right)^2 + \frac{5}{2}}{\frac{5}{2} - 1} = \dfrac{\frac{25}{4} + \frac{10}{4}}{\frac{5}{2} - \frac{2}{2}} = \dfrac{35}{\cancel{4}_2} \cdot \dfrac{\cancel{2}}{3} = \dfrac{35}{6} < 6$

$f(4) = \dfrac{4^2 + 4}{4 - 1} = \dfrac{20}{3} > 6$

Yes, the IVT guarantees a $c \in [5/2, 4]$ s.t. $f(c) = 6$

To Find it set

$\dfrac{x^2+x}{x-1} = 6$

$x^2 + x = 6(x-1)$

$x^2 + x = 6x - 6$

$x^2 - 5x + 6 = 0$

$(x-3)(x-2) = 0$

$\cancel{x=2}$, $\boxed{x=3}$

not in $[5/2, 4]$