This week's Assignments:

01: Sign up for Khan Academy with coach code 3XDPSR.

02: Read sections 1.1 and 1.2 in your textbook and complete at least 45 minutes of exercises on Khan Academy on related topics (outside of class); in addition, complete "Mastery Challenges" as often as they become available to you.

03: Textbook problems from section 1.2 #1-6 all, 15-22 all, 33,34,39,41. This will mostly be completed in class and will be due this Friday. See syllabus for proper formatting of written homework assignments.

Next 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.

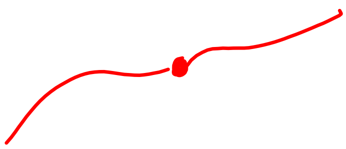
- 1.3 #11,21,27-39 odd, 41-61 odd; 83, 87 — evaluating limits analytically
- 1.3 #63-73 odd; 89, 90 — limits with trig, squeeze theorem
- 1.4 #1-19 odd; — limits of functions with discontinuities
- 1.4 #27-30 all; 43-48 all; — discuss (dis)continuity
- 1.4 #21,23,25,57,61,65,69,99,102 — misc. continuity problems

1.3 Evaluating Limits Analytically

If $\lim_{x\to c} f(x) = f(c)$,

we say that $f(x)$ is

continuous at c.



Evaluating Limits Analytically

Basic Limits

Let $b, c \in \mathbb{R}$, $n > 0$ *an integer*, $f, g -$ *functions*, $\lim_{x\to c} f(x) = L$, $\lim_{x\to c} g(x) = K$

1. Constant $\lim_{x\to c} b = b$
2. Identity $\lim_{x\to c} x = c$
3. Polynomial $\lim_{x\to c} x^n = c^n$
4. Scalar Multiple $\lim_{x\to c}[bf(x)] = bL$
5. Sum or Difference $\lim_{x\to c}[f(x) \pm g(x)] = L \pm K$
6. Product $\lim_{x\to c}[f(x)g(x)] = LK$
7. Quotient $\lim_{x\to c}\left[\frac{f(x)}{g(x)}\right] = \frac{L}{K}$, $K \neq 0$
8. Power $\lim_{x\to c}[f(x)]^n = L^n$

$\lim_{x\to c}[f(x) \pm g(x)] = \lim_{x\to c} f(x) \pm \lim_{x\to c} g(x)$

$\lim_{x\to c}[f(x)g(x)] = \left[\lim_{x\to c} f(x)\right] \cdot \left[\lim_{x\to c} g(x)\right]$

$\lim_{x\to c} \frac{f(x)}{g(x)} = \frac{\lim_{x\to c} f(x)}{\lim_{x\to c} g(x)}$, $\lim_{x\to c} g(x) \neq 0$

$\lim_{x\to c}[f(x)]^n = \left[\lim_{x\to c} f(x)\right]^n$

Note: If substitution yields $\frac{0}{0}$, an indeterminate form, the expression must be rewritten in order to evaluate the limit.

$\lim_{x\to c} a = a$ | $\lim_{x\to 5}(-3) = -3$

$\lim_{x\to c} x = c$ | $\lim_{x\to -\pi} x = -\pi$

$\lim_{x\to c} x^n = c^n$ | $\lim_{x\to -1} x^5 = (-1)^5 = -1$

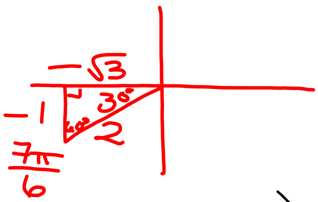
1.3

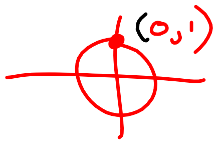
12. $\lim_{x\to 1}\left(3x^3-2x^2+4\right) = 3(1)^3-2(1)^2+4$

$= 5$

18. $\lim_{x\to 3}\frac{\sqrt{x+1}}{x-4} = \frac{\sqrt{3+1}}{3-4} = \frac{\sqrt{4}}{-1} = -2$

30. $\lim_{x\to 1}\sin\frac{\pi x}{2} = \sin\frac{\pi}{2} = 1$





36. $\lim_{x\to 7}\sec\left(\frac{\pi x}{6}\right) = \sec\frac{7\pi}{6} = -\frac{2}{\sqrt{3}}$

38. $\lim_{x\to c} f(x) = \frac{3}{2}$; $\lim_{x\to c} g(x) = \frac{1}{2}$

(a) $\lim_{x\to c} [4f(x)] = 4 \cdot \frac{3}{2}$

(b) $\lim_{x\to c} [f(x)+g(x)] = \frac{3}{2} + \frac{1}{2}$

(c) $\lim_{x\to c} [f(x)g(x)] = (3/2)(1/2)$

(d) $\lim_{x\to c} \frac{f(x)}{g(x)} = \frac{3/2}{1/2}$

$$\lim_{x\to 3} \frac{x^2-2x-3}{x-3} = \lim_{x\to 3} \frac{\cancel{(x-3)}(x+1)}{\cancel{x-3}}$$

$$= \lim_{x\to 3} (x+1) = \boxed{4}$$

$$\lim_{x\to 4}\frac{x-4}{\sqrt{x}-2}\cdot\frac{\sqrt{x}+2}{\sqrt{x}+2}=$$

$$=\lim_{x\to 4}\frac{\cancel{(x-4)}(\sqrt{x}+2)}{\cancel{x-4}}$$

$$=\lim_{x\to 4}(\sqrt{x}+2)=\boxed{4}$$

Given $f(x)=2x^2+3x+1$

$$\lim_{h\to 0}\frac{f(x+h)-f(x)}{h}$$

$$=\lim_{h\to 0}\frac{2(x+h)^2+3(x+h)+1-(2x^2+3x+1)}{h}$$

$$=\lim_{h\to 0}\frac{2(x^2+2xh+h^2)+3x+3h+1-2x^2-3x-1}{h}$$

$$=\lim_{h\to 0}\frac{\cancel{2x^2}+4xh+2h^2\cancel{+3x}+3h\cancel{+1}\cancel{-2x^2}\cancel{-3x}\cancel{-1}}{h}$$

$$=\lim_{h\to 0}\frac{\cancel{h}(4x+2h+3)}{\cancel{h}}$$

$$=\lim_{h\to 0}(4x+2h+3)=\boxed{4x+3}$$