If you still need to get into this class, please go to Neill 107, preferably after 1:00 today.

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Last time: trig functions.

Ex: graph \( y = \sin(4x) + 2 \)

Recall: graph of \( y = f(x) + 2 \) is 2 units up from graph of \( y = f(x) \).
\[
\sin(\pi x) \quad \text{goes through period when}
\]
\[
x \text{ goes } 0 \to 2\pi \quad \text{and}
\]
\[
\sin(\pi x) \quad \text{goes through period when}
\]
\[
x \text{ goes } 0 \to 2\pi
\]
\[
x = \frac{1}{2} + \frac{n}{2}
\]

So:
\[
x = \frac{1}{2} + n \pi
\]

Can also say:
\[
x = \frac{1}{2} + n \pi \quad \text{or} \quad x = \frac{1}{2} + n \pi + \pi
\]

If integer and only if:
\[
x = \frac{(2n+1) \pi}{2}
\]

\[
\sin (3x) = \mp \frac{1}{2}
\]

Solve:
\[
x = \frac{\pi}{6}, \frac{5\pi}{6}
\]
Graph $y = \sqrt{\frac{1}{3}x - 4}$.

Ex of graph transformation:

$y = \sqrt{\frac{1}{3}x - 4}$

$y = \pm \sqrt{\frac{1}{3}x - 4}$

$y = \pm \sqrt{\frac{1}{3}x + 3}$

$y = \pm \sqrt{\frac{1}{3}x - 4} + h$

$y = \pm \sqrt{\frac{1}{3}x + 3} + k$
Consider $g(x) = \left\{ \begin{array}{ll}
2, & x \leq -2 \\
x + 3, & x > -2
\end{array} \right.$

The limit is $1$.
\[ f(1) \text{ DNE.} \]
\[ x \leftarrow 1 \]
\[ \lim_{x \to 1} f(x) = 2. \]
\[ \lim_{x \to 1^-} f(x) = 2 \]
\[ \lim_{x \to 1^+} f(x) = 2 \]

\[ \lim_{x \to 1} (xf(x)) = 2 \]

\[ \lim_{x \to 1^-} (xf(x)) = 2 \]

\[ \lim_{x \to 1^+} (xf(x)) = 2 \]
Can guess that limit by doing:

take mystery function \( f(x) \), (we have

\[ \lim_{x \to 5^+} f(x) \]

and

\[ \lim_{x \to 2^-} f(x) \]

also, \( f(2) = 5 \)
(assuming these exist):

\[
\lim_{{x \to a}} f(x) = \lim_{{x \to a}} g(x) = \lim_{{x \to a}} (f(x) + g(x)) = \lim_{{x \to a}} h(x)
\]

1. \(p.35)\): \[ \lim_{{x \to a}} [f(x) + g(x)] = \lim_{{x \to a}} f(x) + \lim_{{x \to a}} g(x) \]

\[ \begin{array}{c|c|c|c|c}
\text{Guess:} & f(x) & g(x) & f(x) + g(x) & f(x) + g(x) \\
\hline
10 & 2.98 & 2.99 & 5.96 & 5.98
\end{array} \]

Limit techniques for

\[
\begin{align*}
\text{calculation limits:} & \\
\text{Rule / techniques for:} & \\
\end{align*}
\]
Rule: \( \frac{f(x)}{g(x)} \) for polynomials. Then

\[
\lim_{x \to a} \frac{f(x)}{g(x)} = \frac{\lim_{x \to a} f(x)}{\lim_{x \to a} g(x)}.
\]

Assuming these exist.

Let \( a \) and both \( \lim_{x \to a} f(x) \) and \( \lim_{x \to a} g(x) \) exist.
\[
\lim_{x \to 3} \frac{x^2 - 2x + 5}{x^3 (x^2 - 2x + 5)} = 8 - 4 + 5 = 9
\]