What you'll Learn About
- Finite Limits as x approaches positive or negative infinity
- End Behavior Models
- Infinite Limits as x approaches a value

* If power on top bigger lim → ±∞

* If power in denominator is bigger lim = 0

End Behavior Model

Horizontal asymptotes

Find the limit as $x \to \pm\infty$

4A) $\lim_{x\to\infty} \frac{x+3}{3x^3-x+1} = 0$

$\lim_{x\to\infty} \frac{x}{3x^3} = \frac{1}{3x^2} = 0$

4B) $\lim_{x\to\infty} \frac{3x^3-x+1}{x+3} = \infty$

$\lim_{x\to\infty} \frac{3x^3}{x} = 3x^2$

4C) $\lim_{x\to\infty} \frac{3x^3-x+1}{x^3+3} = 3$

$\lim_{x\to\infty} \frac{3x^3}{x^3} = 3$

* If powers are the same look at coefficients

4D) $\lim_{x\to-\infty} \frac{5x^2-x+2}{5x^2+10} = 1$

$\lim_{x\to-\infty} \frac{5x^2}{5x^2} = \frac{5}{5}$

4E) $\lim_{x\to-\infty} \frac{x^3+x-1}{x^2-5x+2} = -\infty$

$\lim_{x\to-\infty} \frac{x^3}{x^2} = x$

P. 76
4, 21, 22
39-44

22A) $\lim_{x\to\infty}\left(\frac{5}{x}+2\right)\left(\frac{8x^2-1}{2x^2}\right)$

$(0+2)(4)$

8

22B) $\lim_{x\to-\infty}\left(\frac{5}{x}+2\right)\left(\frac{8x^2-1}{2x^2}\right)$

$(0+2)(4)$

8

Horizontal asy at $y=8$

$y=x$

22C) $\lim_{x\to\infty}\left(\frac{5}{x}+2\right)\left(\frac{8x^3-1}{2x^2}\right)$

$(0+2)(\infty)$

∞ end behavior

22D) $\lim_{x\to-\infty}\left(\frac{5}{x}+2\right)\left(\frac{8x^3-1}{2x^2}\right)$

$(0+2)(-\infty)$

$-\infty$

Find the limit as x approaches a number

14A) $\lim_{x\to -2^+} \frac{x}{x+2} =$ 14B) $\lim_{x\to -2^-} \frac{x}{x+2} =$ 14C) $\lim_{x\to -2} \frac{x}{x+2} =$

Using the limits found above graph $f(x) = \frac{x}{x+2}$

Find the vertical asymptotes of the graph and then describe the behavior to the left and right of the vertical asymptote

30. $f(x) = \frac{1-x}{2x^2-5x-3}$

Use your results from above to sketch a graph of $f(x) = \frac{1-x}{2x^2-5x-3}$

Find the limit of the functions that involve e^x

3. $\lim_{x\to\infty} \frac{e^{-x}}{x}$ $\lim_{x\to-\infty} \frac{e^{-x}}{x}$

A) $\lim_{x\to\infty} \frac{e^x+2x}{2x} =$ B) $\lim_{x\to-\infty} \frac{e^x+2x}{2x} =$

Find the limit of the functions that involve sine and cosine

C) $\lim_{x\to-\infty} \frac{x^3+cosx}{x^3}$ D) $\lim_{x\to+\infty} \frac{x^3+cosx}{x^3}$

E) $\lim_{x\to\infty} \sin\left(\frac{1}{x}\right)$ F) $\lim_{x\to\infty} \frac{\sin\left(\frac{1}{x}\right)}{1+\frac{1}{x}}$

Find the limit of the functions that involve absolute value

8A) $\lim_{x\to\infty} \frac{5x-2}{|x|-1}$ 8B) $\lim_{x\to-\infty} \frac{5x-2}{|x|-1}$

53A) Find the limit of f(x) as

a) $x \to -\infty$, b) $x \to \infty$, c) $x \to 0^+$, d) $x \to 0^-$ e) $x \to 1^-$ *f)* $x \to 1^+$

If $f(x) = \begin{cases} \dfrac{3x-1}{2x+5} & x < 0 \\ \dfrac{2}{x-1} & x \geq 0 \end{cases}$

55A) Sketch a graph of a function that satisfies the following conditions.

$\lim_{x \to 0} f(x) = 2$

$\lim_{x \to -2^-} f(x) = \infty$

$\lim_{x \to -2^+} f(x) = -\infty$

$\lim_{x \to -\infty} f(x) = 2$

$\lim_{x \to \infty} f(x) = -3$

$\lim_{x \to 3^-} f(x) = \infty$

$\lim_{x \to 3^+} f(x) = -\infty$

	Find the limit of the functions using the sandwich theorem *Example 9 (p.65)* $\lim_{x\to 0}\left[x^2 \sin\left(\frac{1}{x}\right)\right]$ p.76 10) $\lim_{x\to-\infty} \frac{1-\cos x}{x^2}$ 12) $\lim_{x\to\infty} \frac{\sin x^2}{x}$
