

LIMITS AND CONTINUITY

LESSON 1: ESTIMATING LIMITS

- Objectives:
1. To understand the meaning of $\lim_{x \rightarrow b} f(x)$
 2. To know the difference between $\lim_{x \rightarrow b} f(x)$ and $f(b)$
 3. $\lim_{x \rightarrow b} f(x)$ exists iff $\lim_{x \rightarrow b^+} f(x) = \lim_{x \rightarrow b^-} f(x)$
 4. To use the graphing calculator as a tool in computing limits

Limits

$\lim_{x \rightarrow b} f(x)$ is the behavior of the function $f(x)$ for values of x near b

$f(b)$ is the value of the function at $x = b$

Examples

1. $\lim_{x \rightarrow 1} (4x - 2)$

5. $\lim_{x \rightarrow \infty} \frac{x}{2x - 1}$

2. $\lim_{x \rightarrow 0} \frac{x^2}{3}$

6. $\lim_{x \rightarrow \infty} \frac{x}{e^x}$

3. $\lim_{x \rightarrow 0} \frac{1}{x^2}$

7. $\lim_{x \rightarrow -\infty} \frac{x}{e^x}$

4. $\lim_{x \rightarrow 2} \frac{3x}{3x + 2}$

8. $\lim_{x \rightarrow \sqrt{3}} \frac{x^3 + 7x^2 - 3x - 21}{x - \sqrt{3}}$

Problems for Lesson 1

1. $\lim_{x \rightarrow -2} (2x^2 + 8x + 10)$

2. $\lim_{x \rightarrow 0} (1+x)^{\frac{1}{x}}$

3. $\lim_{x \rightarrow 0} \frac{\sin 6x}{\sin 2x}$

4. $\lim_{x \rightarrow 3} \sqrt{9-x^2}$

5. $\lim_{x \rightarrow 0} \frac{\sin x}{x}$

6. $\lim_{x \rightarrow 0} \frac{1-\cos x}{x}$

7. $\lim_{x \rightarrow 5} \frac{|x-5|}{x-5}$

8. $\lim_{x \rightarrow 0} \sqrt[3]{x}$

9. $f(x) = \begin{cases} x, & -1 \leq x \leq 2 \\ 2x-4, & 2 < x < 4 \\ 4, & 4 \leq x \leq 6 \end{cases}$

Find $\lim_{x \rightarrow b} f(x)$ for $b = -1, 0, 2, 3, 4, 6$