Calculus 1.5 Infinite Limits and Limits at Infinity - Day 2

Homework:

Example 1

Alternate Method for finding limits at infinity of rational functions

a. Degree on top is larger - infinity
b. Degree on bottom is larger - 0
c. Degrees are the same - a/b

Try these problems:

(a) $\lim_{x\to\infty} \frac{3x^2-2x+8}{x^2+1}$

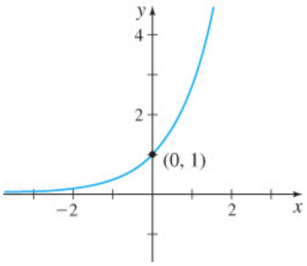
(b) $\lim_{x\to-\infty} \frac{4x^2-5x}{x^3+1}$

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

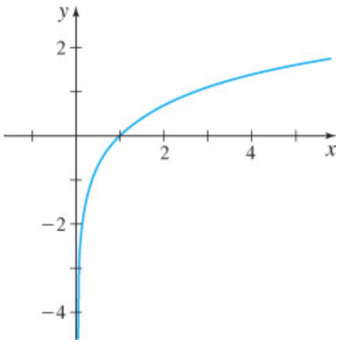
Example 2

Finding limit at infinity using dominance

$\lim_{x\to-\infty} e^x = 0 \qquad \lim_{x\to\infty} e^x = \infty$



$\lim_{x\to\infty} \ln x = \infty$



1. Exponential
2. Polynomial
3. logarithmic

a. $\lim_{x\to\infty} \frac{5x}{e^{2x}}$ $\lim_{x\to+\infty} \frac{5x}{e^{2x}}$

b. $\lim_{x\to\infty} \frac{e^{x+3}}{x^2-5x+6}$ $\lim_{x\to+\infty} \frac{e^{x+3}}{x^2-5x+6}$

c. $\lim_{x\to\infty} \frac{5x}{\ln(2x-3)}$. $\lim_{x\to+\infty} \frac{5x}{\ln(2x-3)}$

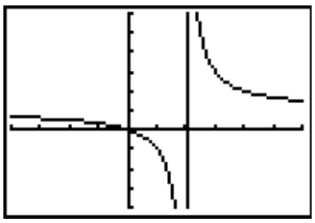
Calculus 1.5 Infinite Limits and Limits at Infinity - Day 2

Example 3

Identify the domain of the following functions:

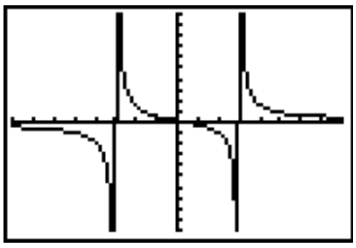
1. $f(x) = \dfrac{x}{x-2}$

D: _____



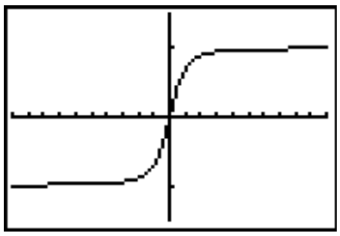
2. $g(x) = \dfrac{3x-1}{x^2-9}$

D: _____



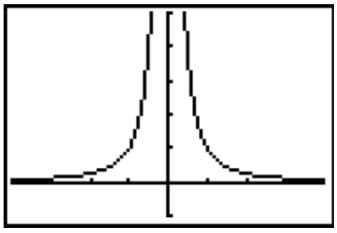
3. $h(x) = \dfrac{x}{\sqrt{x^2+1}}$

D: _____



4. $j(x) = \dfrac{1}{x^2}$

D: _____



Example 4

Determine the following limits. The functions referred to are the ones shown above

a. $\lim_{x \to 2^-} f(x) =$
b. $\lim_{x \to 2^+} f(x) =$
c. $\lim_{x \to -3^-} g(x) =$
d. $\lim_{x \to -3^+} g(x) =$
e. $\lim_{x \to 3^-} g(x) =$
f. $\lim_{x \to 3^+} g(x) =$
g. $\lim_{x \to 0^-} j(x) =$
h. $\lim_{x \to 0^+} j(x) =$

Example 5

Identify the vertical asymptotes, if any, of each function above

a. $f(x)$ _____

b. $g(x)$ _____

c. $h(x)$ _____

d. $j(x)$ _____

Calculus 1.5 Infinite Limits and Limits at Infinity - Day 2

Example 6

Find each Limit

1. $\lim_{x\to\infty} \dfrac{x^4+5x^3+3x^2-10}{1-2x^2}$

2. $\lim_{x\to\infty} \dfrac{x+\sin x}{x-\cos x}$

3. $\lim_{x\to\infty} \dfrac{x+1}{\sqrt{4x^2+2}}$

4. $\lim_{x\to-\infty} \dfrac{x}{|x|}$

5. $f(x)=\begin{cases} \dfrac{5}{x} & x<0 \\ 1 & x=0 \\ \dfrac{\sin x}{x} & x>0 \end{cases}$

6. $\lim_{x\to\infty} \dfrac{(x+3)(x-3)}{2x^2-5x+1}$

a. $\lim_{x\to-\infty} f(x)$

b. $\lim_{x\to\infty} f(x)$

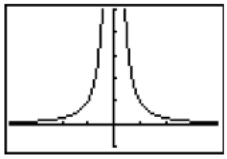
c. $\lim_{x\to0^-} f(x)$

d. $\lim_{x\to0^+} f(x)$

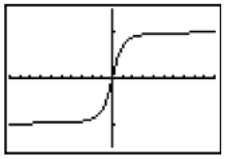
Example 7

Determine the following limits

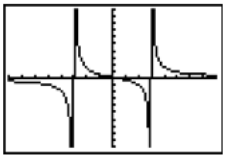
1. $f(x)=\dfrac{x}{x-2}$



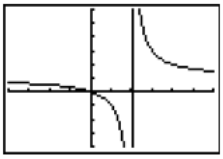
2. $g(x)=\dfrac{3x-1}{x^2-9}$



3. $h(x)=\dfrac{x}{\sqrt{x^2+1}}$



4. $j(x)=\dfrac{1}{x^2}$



a. $\lim_{x\to\infty} f(x)=$

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

c. $\lim_{x\to\infty} g(x)=$

d. $\lim_{x\to-\infty} g(x)=$

e. $\lim_{x\to\infty} h(x)=$

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

g. $\lim_{x\to\infty} j(x)=$

h. $\lim_{x\to-\infty} j(x)=$

Calculus 1.5 Infinite Limits and Limits at Infinity - Day 2

Example 8

Identify the horizontal Asymptotes, if any, of each function in Example 7

a. $f(x)$ _____

b. $g(x)$ _____

c. $h(x)$ _____

d. $j(x)$ _____

NOTES