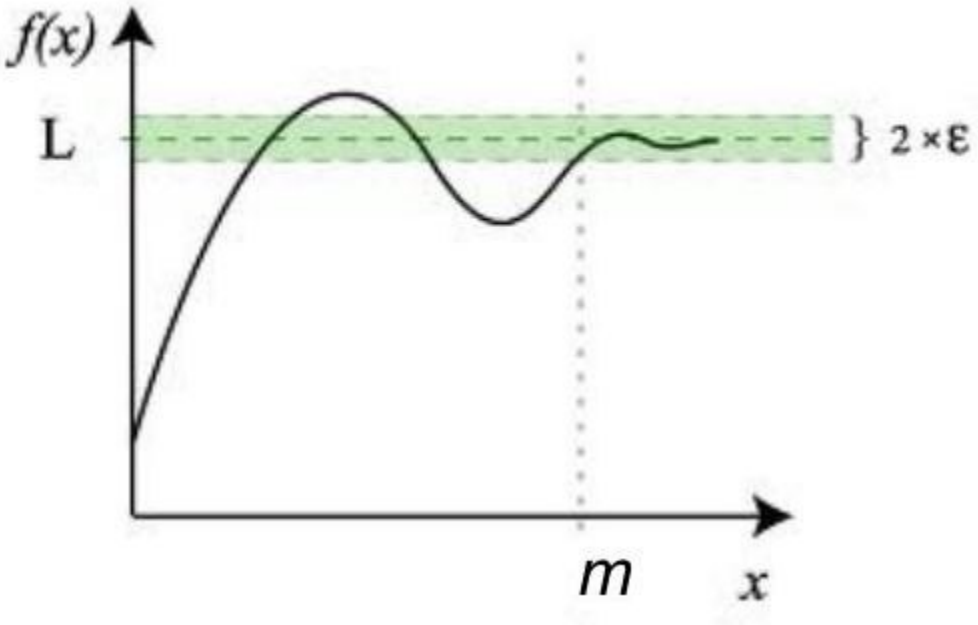
Math 1210 #4a
Limits At Infinity, Infinite Limits

Definition: (Limit as x→∞)

is defined on $[c, \infty)$ for $c \in R$

We say that if for every $\varepsilon > 0$ there is a corresponding number, m such that

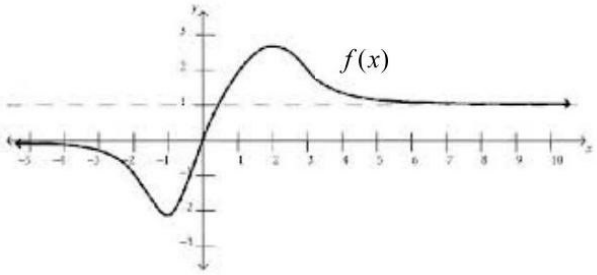


EX 1

Intuitively (looking at the graph) determine these limits.

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

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



EX 2

Show that if n is a positive integer, then $\lim_{x\to\infty} \frac{1}{x^n} = 0$.

EX 3

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

EX 4

$$\lim_{x\to\infty} \frac{3x^4 - 2x^3 + 53}{x^3 + 7} =$$

EX 5

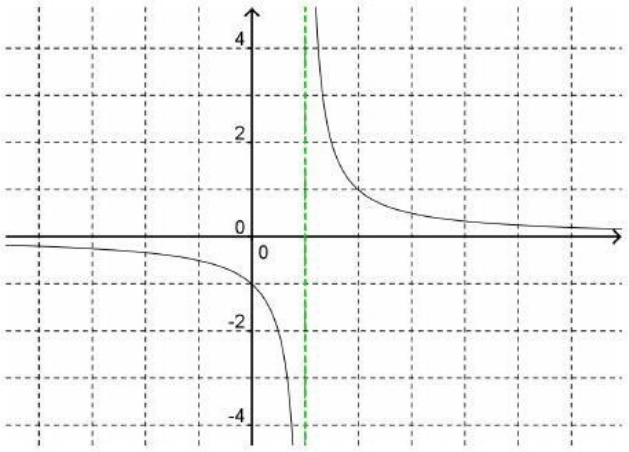
$\lim_{x\to\infty} \frac{2x^2+5x-1}{x^2+3x} =$

Definition: (Infinite limit)

We say $\lim_{x\to c^+} f(x) = \infty$ if for every positive number, m there is a corresponding $\delta > 0$ such that $0 < x - c < \delta \Rightarrow f(x) > m$

EX 6

Determine these limits looking at this graph of $f(x) = \frac{1}{x-1}$.



$\lim_{x\to\infty} f(x) =$ $\lim_{x\to 1^+} f(x) =$

$\lim_{x\to-\infty} f(x) =$ $\lim_{x\to 1^-} f(x) =$

EX 7

Find the horizontal and vertical asymptotes for this function, then write a few limit statements including ∞. $f(x) = \frac{-2x}{x+3}$

EX 8

8a)

Find the vertical and horizontal asymptotoes for this function.

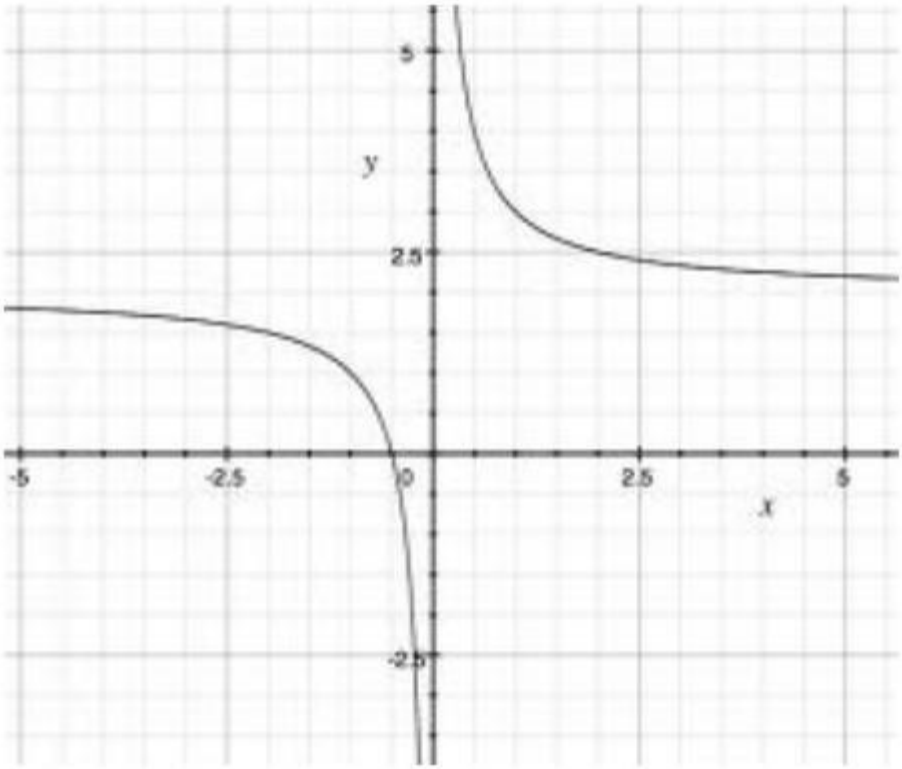
$$f(x) = \frac{2x}{\sqrt{x^2 + 5}}$$

8b)

Determine these limits:

$$\lim_{x\to\infty} f(x) = \qquad \lim_{x\to\sqrt{5}^+} f(x) =$$
$$\lim_{x\to-\infty} f(x) = \qquad \lim_{x\to\sqrt{5}} f(x) =$$

Determine these limits:



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

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

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

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