

Math 1210-3

Monday March 10

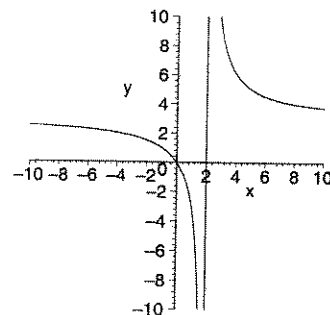
Finish max-min problems Friday.

Then, begin today's notes: §3.5 more graphing
§4.5 Limits with ∞

$f(x)$

"

Exercise 1: Use calculus to plot the graph of $y = \frac{3x}{x-2}$. Also use the limit behavior to discuss asymptotes
(See page 2)



domain:

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

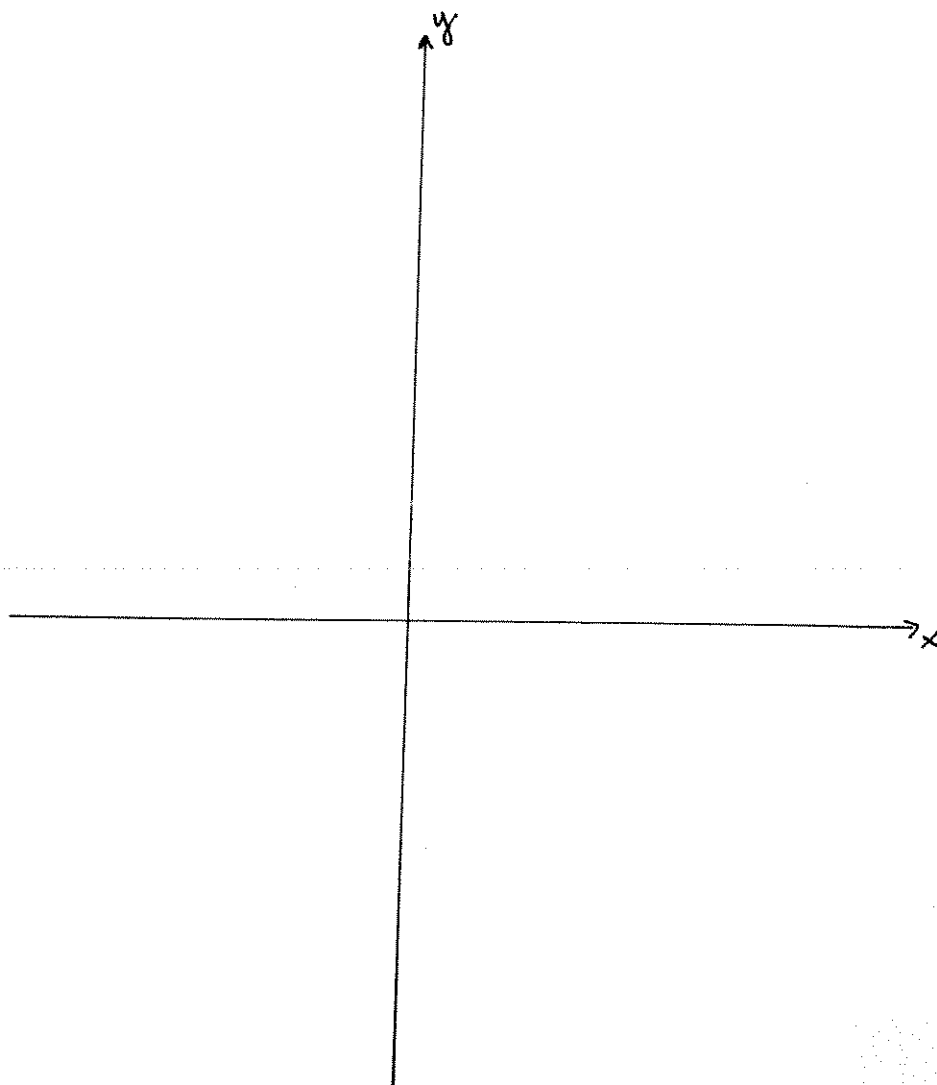
$$\lim_{x \rightarrow -\infty} f(x) =$$

$$\lim_{x \rightarrow 2^+} f(x) =$$

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

$$f'(x)$$

$$f''(x)$$



Definition A

$\lim_{x \rightarrow \infty} f(x) = L$ means imprecisely: As x approaches infinity the values of $f(x)$ approach L

precisely: $\forall \varepsilon > 0 \exists N$ s.t. $x > N \Rightarrow |f(x) - L| < \varepsilon$

"for all $\varepsilon > 0$ there exists N s.t. $x > N$

$\lim_{x \rightarrow -\infty} f(x) = L$ defined analogously. implies $|f(x) - L| < \varepsilon$ "

Also,

$$\lim_{x \rightarrow \infty} f(x) = \infty, \lim_{x \rightarrow \infty} f(x) = -\infty, \lim_{x \rightarrow -\infty} f(x) = \infty, \lim_{x \rightarrow -\infty} f(x) = -\infty.$$

Definition B

$\lim_{x \rightarrow c^+} f(x) = +\infty$ means imprecisely: As x approaches c from the right the values of $f(x)$ approach infinity.

precisely: $\forall N > 0 \exists \delta$ s.t. $c < x < c + \delta \Rightarrow f(x) > N$

$$\lim_{x \rightarrow c^+} f(x) = -\infty$$

$$\lim_{x \rightarrow c^-} f(x) = +\infty$$

$$\lim_{x \rightarrow c^-} f(x) = -\infty$$

} defined analogously.

Definition C

A line $ax + by + c = 0$ is an asymptote to the graph $y = f(x)$ if ^{some} points on the graph become arbitrarily close to the line, as the distance to the origin, $\sqrt{x^2 + y^2}$, becomes arbitrarily large.

precisely,

If $\lim_{x \rightarrow \infty} f(x) = L$ or $\lim_{x \rightarrow -\infty} f(x) = L$, then $y = L$ is a horizontal asymptote

If $\lim_{x \rightarrow c^+} f(x)$, or $\lim_{x \rightarrow c^-} f(x)$ is $+\infty$ or $-\infty$, then $x = c$ is a vertical asymptote

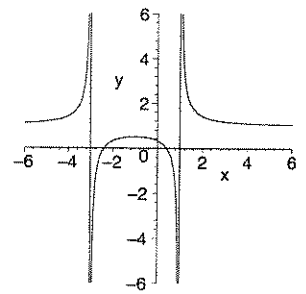
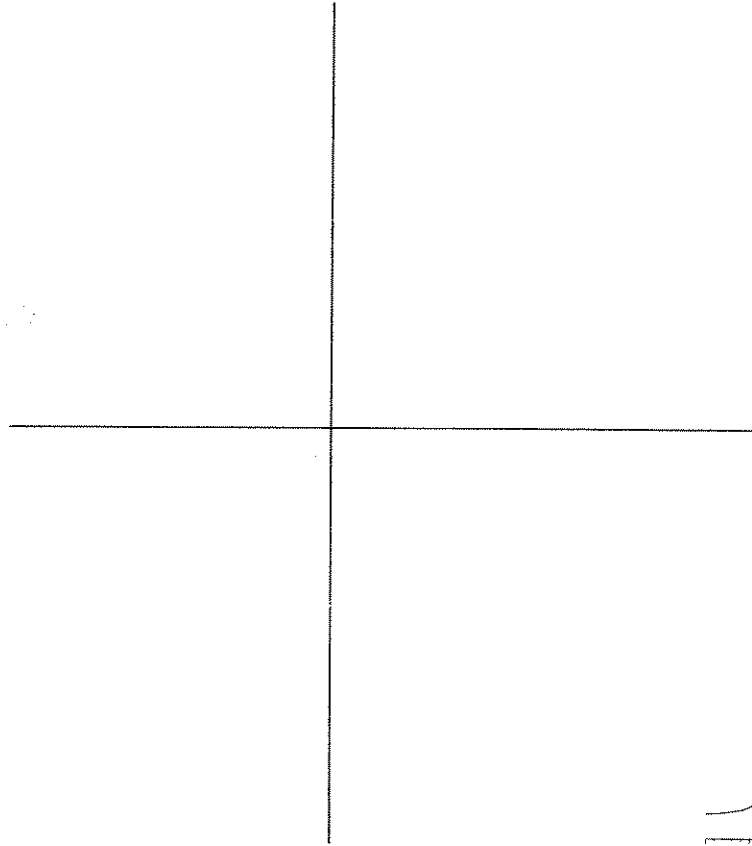
If $\lim_{x \rightarrow \infty} [f(x) - (mx + b)] = 0$ (or if $\lim_{x \rightarrow -\infty} (f(x) - (mx + b)) = 0$)

then $y = mx + b$ is a diagonal asymptote

we'll probably be doing these on Tuesday...

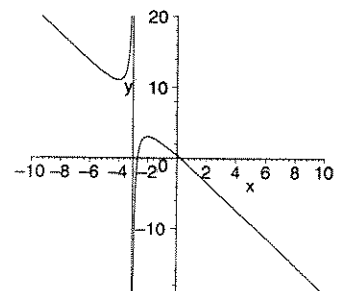
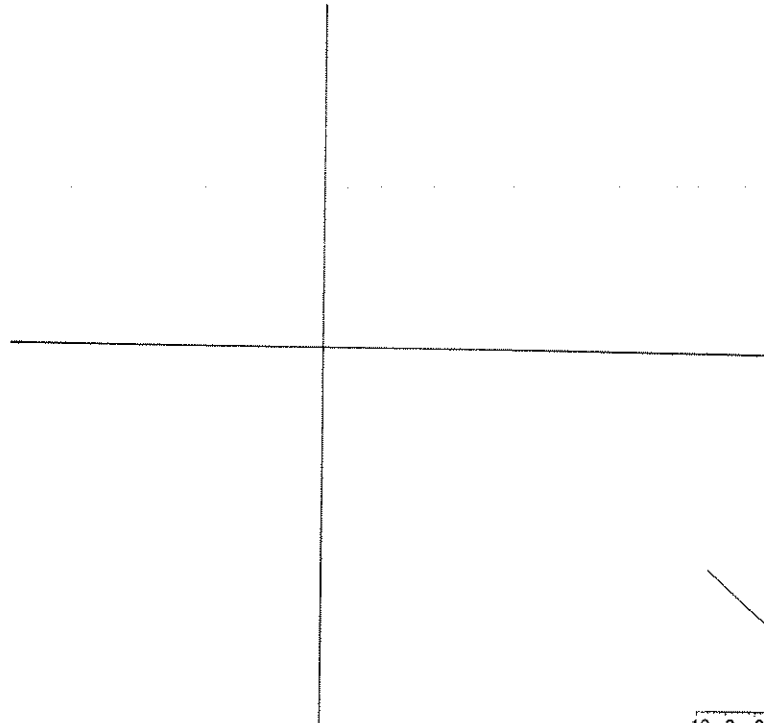
Exercise 2 graph $y = \frac{2}{x^2+2x-3} + 1$ using Calculus and limits (but maybe not $\pm$)

③



Exercise 3 graph $y = \frac{-2x^2-5x+1}{x+3}$ using Calculus.

Hint: First do long division.



Math 1210-3
Exam 2 (after retake 4,5)
distribution
 $n = 87$

