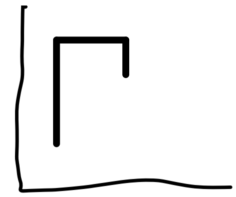
- Exam 2 10/27
- HW Due 10/25 on Sections 20/21.



Section 21: Graphing fcts w/ asymptotes

Steps:

1) Find the domain

2) Find aux/prelim info: Roots* and y-int
   ↓
   may or may not omit

3) Find vertical asymptotes
   - → Usually occur when $f(x) = \text{"}\frac{?}{0}\text{"}$
   - → Investigate LH/RH limits of isolated points not in domain.

4) Find horiz. asymptotes:

$\lim\limits_{x \to -\infty} f(x)$ $\lim\limits_{x \to \infty} f(x)$

$$\underbrace{\text{behavior of } f \text{ as left} \leftarrow x \qquad \text{behavior of } f \text{ as } x \to \text{right}}$$

9 9

If either limit is finite (#), then you have a horiz. asympt. @ y = #.

5) Find crit pts

6) Inc / Dec. Intervals

7) Concavity intervals

8) Sketch!

Ex: Sketch $f(x) = \dfrac{x^2+x-2}{x^2-x}$

Domain: $(-\infty, 0) \cup (0,1) \cup (1, \infty)$

Roots: $x^2+x-2=0$

$(x+2)(x-1)=0$

$x=-2$ | $x=1$

$(-2, 0)$

VA: Check $x=0,\ x=1$

$$\lim_{x\to 0^-} \frac{x^2+x-2}{x^2-x} = \lim_{x\to 0^-} \frac{(x+2)\cancel{(x-1)}}{x\cancel{(x-1)}}$$

$$= \lim_{x\to 0^-} \frac{x+2}{x} \begin{matrix}\rightarrow \\ \rightarrow\end{matrix} \frac{2}{0^-} = -\infty$$

$$\lim_{x\to 0^+} \frac{x^2+x-2}{x^2-x} = \lim_{x\to 0^+} \frac{x+2}{x} \begin{matrix}\rightarrow \\ \rightarrow\end{matrix} \frac{2}{0^+} = \infty$$

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

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

Conclusion: VA @ $x=0$

HA:

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

$$= 1$$

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

Conclusion: HA @ $y=1$

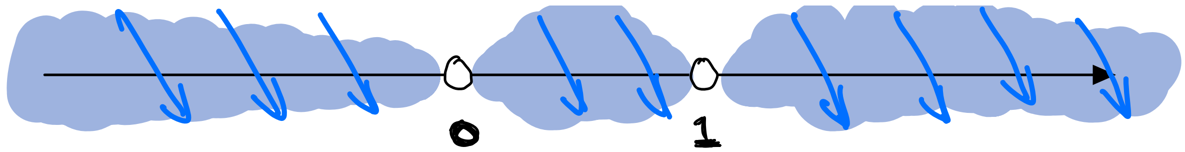
$f'(x) = \frac{-2}{x^2}$, $f''(x) = \frac{4}{x^3}$

Crit. pts:

When is $f'(x)=0$?	When is $f'(x)$ und?
N/A	$x=0$

Conclusion: No crit pts.

Inc/Dec:



Conclusion: dec on

$(-\infty, 0) \cup (0,1) \cup (1, \infty)$

Concavity: $f''(x) = \dfrac{4}{x^3}$