

Math 130 Day 35

Office Hours (LN 301/301.5): M 3:30-4:30, Tu 11:00-1:00, W 12:15-1:15, F 1:30-2:30. Other times by appointment. **Math Intern:** Sun through Thurs: 3:00–6:00, 7:00–10:00pm. **Website:** Use the links at the course homepage on **Canvas** or go to my course Webpage: <http://math.hws.edu/~mitchell/Math130F16/index.html>.

Today we will finish our discussion on graphing with both horizontal and vertical asymptotes and limits at ∞ from Section 4.3. Recall that we earlier defined:

1. Vertical Asymptote. The function $y = f(x)$ has a vertical asymptote at $x = a$ if either

$$\lim_{x \rightarrow a^+} f(x) = +\infty \text{ or } -\infty \quad \text{and/or} \quad \lim_{x \rightarrow a^-} f(x) = +\infty \text{ or } -\infty.$$

2. Horizontal Asymptote. The function $y = f(x)$ has a horizontal asymptote at $y = L$ if either

$$\lim_{x \rightarrow +\infty} f(x) = L \quad \text{and/or} \quad \lim_{x \rightarrow -\infty} f(x) = L.$$

Exam III

Exam on Monday in Albright Auditorium. ☞ Come 15–20 minutes early. Coverage:

- Finding extreme values on a closed interval or an interval with a single relative extrema.
- Graphing a function using first and second derivatives (relative extremes, inflections, concavity, increasing and decreasing behavior);
- Graphing a function for which you are given some information (e.g., number lines for the first and second derivatives, or a graph of the first derivative);
- Related Rate problems;
- Optimization problems (including justification);
- Definitions and theorems and using them (e.g., MVT, EVT, CIT, SCPT, First Derivative Test, Concavity Test, critical point, absolute max or min, drawing functions with specified properties);
- Logarithmic differentiation;
- Derivatives of general exponentials $y = b^{f(x)}$
- Review the homework and labs since the last exam and Practice Test now online (answers Friday).

Practice and Reading

- Page 268 #11, 15, and 17. (Draw complete graphs including any HA's and VA's.)
- On Monday, December 28, we will discuss l'Hôpital's Rule. This is a neat way to evaluate certain limits. Read about l'Hôpital's Rule in Section 4.7, pages 297–300.

Homework and WeBWork

- I have posted set Day35–36. The problems are due Monday night, November 28. *Start them now.*
 - I have also posted set Day37. The problems are due Thursday night, December 1. Some are review of asymptotes. *Start them now.* Others concern the new material for class after the break. Skip them for the moment.
 - Try the bonus problems on the back.

Math 130, Day 35. Optional. Name: _____

1. Does $f(x) = \frac{6x^2 - 12x}{x^2 - 4}$ have a vertical asymptote at $x = 2$? Justify your answer with appropriate limit calculations.

2. **Bonus:** Here is information about the first and second derivatives of a function and its vertical and horizontal asymptotes. Sketch a function that satisfies these conditions. Indicate on your graph which points are local extrema and which are inflections. **NID** means the point is “not in the domain” of the original function. Let $f(0) = 0$ and $f(5) = -2$. Also $\lim_{x \rightarrow 2^+} f(x) = -\infty$, $\lim_{x \rightarrow 2^-} f(x) = +\infty$, $\lim_{x \rightarrow +\infty} f(x) = -1$, and $\lim_{x \rightarrow -\infty} f(x) = -\infty$.

$$f' \quad \begin{array}{ccccccc} & + & + & + & 0 & ++ & \text{NID} & ++ \\ & & & & | & & | & \\ & & & & 0 & & 2 & \end{array}$$

$$f'' \quad \begin{array}{ccc} & - - - & 0 \quad ++ \text{NID} \quad - - \\ & & 0 \quad \quad \quad 2 \end{array}$$

