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Office: South Hall, 6431 V

**OH:** M 11-12pm / **ML:** Th 1-3pm

L'Hôpital's Rule and Sketching Curves

**3A**: Week 10

Name:

Collaborators:

Section Day/Time:

### L'Hôpital's Rule and Sketching Curves

## WebWork

13. Find  $\lim_{x\to 0} (1-2x)^{1/x}$ . Use l'Hôpital's Rule if appropriate. If the limit is  $\pm \infty$ , explain why. If the limit does not exist, explain why.

- **20.** Consider the graph of the function  $f(x) = \frac{-2x^2 + 5x 1}{2x 1}$ .
  - a) What is the *y*-intercept of the graph?
  - b) What are the x-intercepts of the graph?
  - c) At what values of x does the graph have a vertical asymptote?
  - d) At what values of y does the graph have a horizontal asymptote?
  - e) What is the equation of the slant asymptote with the highest slope?
  - f) For what values of x is f decreasing?
  - g) For what values of x is f concave up?
- **38.** A farmer with 720 ft of fencing wants to enclose a rectangular area and then divide it into four pens with fencing parallel to one side of the rectangle. What is the largest possible total area of the four pens?

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# Group Work

### L'Hôpital's Rule

If 
$$\lim_{x\to a}\frac{f(x)}{g(x)}$$
 has the form \_\_\_\_\_ or \_\_\_\_, L'Hôpital's Rule says that  $\lim_{x\to a}\frac{f(x)}{g(x)}=$ 

1. Calculate the following limits:

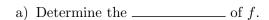
a) 
$$\lim_{x \to \infty} \frac{\ln(3x)}{x^2}$$

b) 
$$\lim_{x \to 1^+} \left( \frac{1}{\ln(x)} - \frac{1}{x - 1} \right)$$

c) 
$$\lim_{x \to \infty} (e^x + x)^{1/x}$$

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2. Sketch the graph of  $f(x) = \frac{x^2 + x - 2}{x^2}$ , filling in the following guide taken from lecture notes. (Try not to look at your notes unless absolutely needed.)



b) Find the x- and y- \_\_\_\_\_ of the graph.

c) Determine the \_\_\_\_\_ (even/odd) of the graph (if it exists).

d) Find the vertical \_\_\_\_\_ of f.

e) Determine the behavior at the \_\_\_\_\_ of the graph by looking at \_\_\_\_\_ and \_\_\_\_.

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f) Draw number lines and use derivatives (f' and f'') to determine where f is ...

i)

ii)

iii)

iv)

Use this information to determine all local and absolute \_\_\_\_\_

g) \_\_\_\_\_ f at the "interesting" places (i.e., at places such as those in parts b & f).

h) \_\_\_\_\_ the graph using all the information, and "connecting the dots".

