

Lab 9

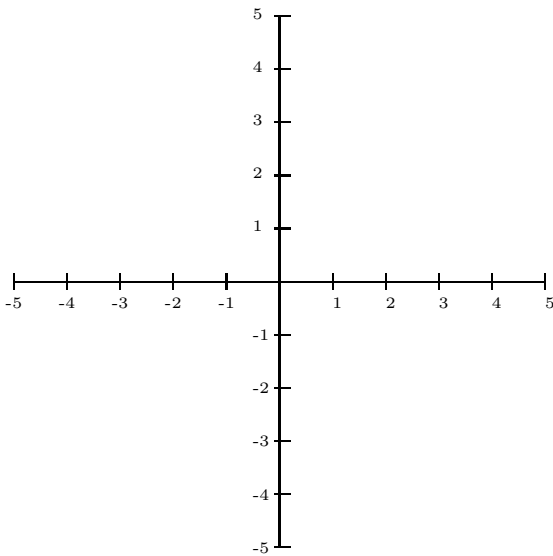
Name _____

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The purpose of lab 9 is to give you practice in curve sketching and to utilize some of the optimization and related rates techniques you have learned.

1. Find all relevant features of the function $f(x) = e^{\frac{-2}{x}}$. Sketch a graph on the axes below.



Domain:

Range:

Horizontal Asymptotes:

Vertical Asymptotes:

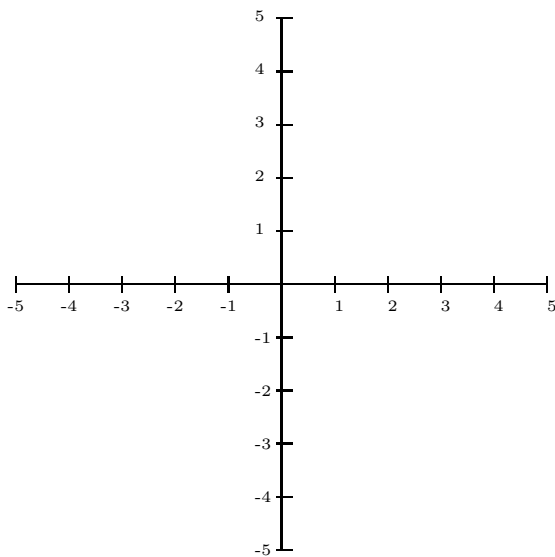
Extrema:

(intervals of increase/decrease)

Points of Inflection:

(intervals of concave up/down)

2. Find all relevant features of the function $f(x) = \sqrt[3]{2x^2 - 1}$. Sketch a graph on the axes below.



Domain:

Range:

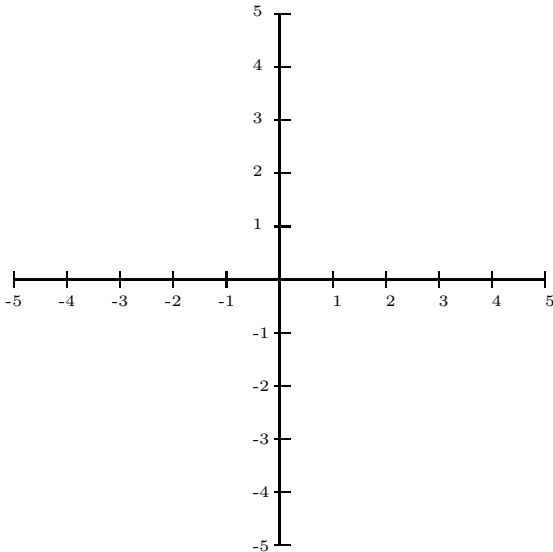
Horizontal Asymptotes:

Vertical Asymptotes:

Extrema:
(intervals of increase/decrease)

Points of Inflection:
(intervals of concave up/down)

3. Find all relevant features of the function $f(x) = \tan^{-1} \frac{1}{x^2 - 1}$. Sketch a graph on the axes below.



Domain:

Range:

Horizontal Asymptotes:

Vertical Asymptotes:

Extrema:
(intervals of increase/decrease)

Points of Inflection:
(intervals of concave up/down)

4. Suppose that group tickets to a concert are sold at \$40 per ticket if 20 tickets are ordered, but cost \$1 per ticket less for each extra ticket ordered, up to a maximum of 50 tickets. (For example, if 23 tickets are ordered, the price is \$37 per ticket.) Find the number of tickets that maximizes the total cost of the tickets. (That is, the cost for the entire group.)

5. Suppose a 6-ft-tall person is 6 feet away from an 18-ft-tall lamppost. If the person is moving toward the lamppost at a rate of 3 ft/s, at what rate is the length of the shadow changing?

6. Your parents are going to knock out the bottom of the entire length, l , of the south wall of their house and turn it into a greenhouse by replacing the bottom portion of the wall with a huge sloped piece of glass (which is expensive). They have already decided they are going to spend a certain fixed amount, k . The triangular ends of the greenhouse will be made of various materials they already have lying around.

The floor space in the greenhouse is only considered usable if they can both stand up in it, so part of it will be unusable. They want to choose the dimensions of the greenhouse to get the most usable floor space. What should the dimensions of the greenhouse be and how much usable space will your parents get? (You should end up with an expression in l, k , and h , where h is the height of the tallest parent.)

hints:

- (a) Let x be the distance the tallest parent can walk into the greenhouse then get x as an expression of width of the glass and the angle the glass makes with the ground.
- (b) Find the critical points.
- (c) Maximize the area.