

Name: \_\_\_\_\_

Each problem is worth 25 points. Complete at least six problems; you may complete the seventh for extra credit. Show all your work.

1. Use limit laws to find

$$\lim_{x \rightarrow \infty} \left( \frac{x}{1000} + 500 \cos(250x) \right)$$

2. Find

$$\lim_{x \rightarrow \frac{\pi}{2}} \frac{1}{1 + \sec x}$$

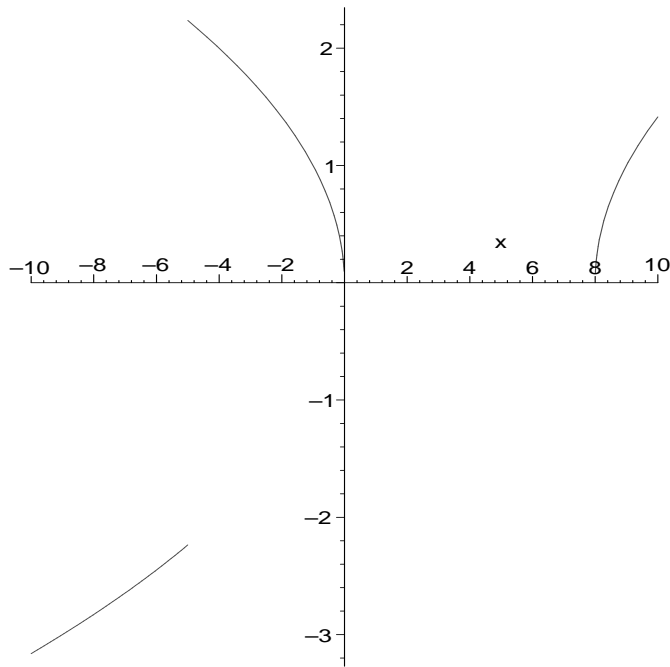
3. Use limits to find all asymptotes of

$$\frac{x^2 - 4}{x^2 - 4x + 4}$$

4. Use numerical approximation to find the value of

$$\lim_{h \rightarrow 0} \frac{e^h - 1}{h}$$

5. Determine where the function  $f(x)$  pictured below is discontinuous. State why the function is discontinuous at each of the locations you specify.



6. Use the definition of the limit to show that

$$\lim_{x \rightarrow 0^-} \frac{1}{x} = -\infty$$

(Recall that  $\lim_{x \rightarrow a^-} f(x) = -\infty$  means that for all  $M < 0$ , there exists  $\delta > 0$  such that  $0 < |x - a| < \delta$  and  $x < a \Rightarrow f(x) < M$ .)

7. Graph the following sets of parametric equations:  $(x = e^x, y = e^{-x})$ , and  $(x = \sin x, y = \csc x)$ . Describe how they differ.