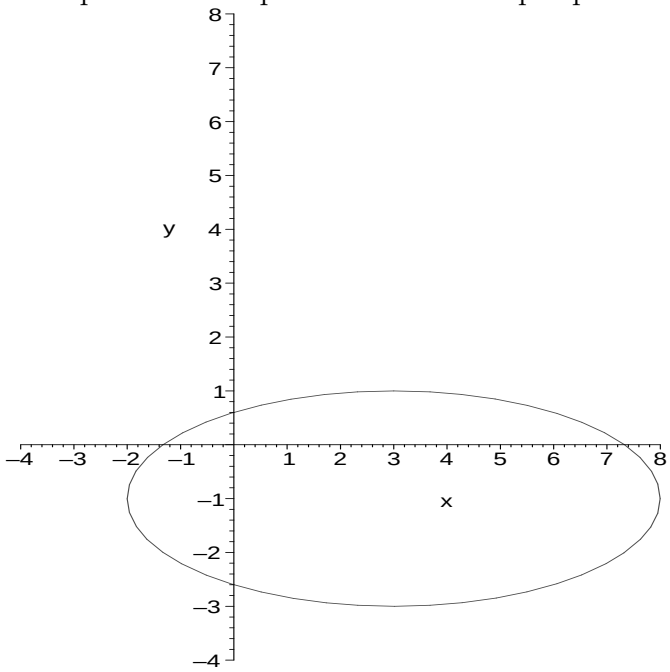
Name: _____

Each problem is worth 15 points. Show all your work.

1. Find parametric equations for the ellipse pictured below.



2. State the formal definition of the limit, and use it to show that

$$\lim_{x \to 0} x^4 = 0$$

3. Let $f(x) = \frac{|x|}{x} + 4$ and $g(x) = -\frac{2|x|}{x} + 8$. For each of the limits listed below, find the limit or explain why it does not exist.

(i) $\lim_{x \to 0^+} f(x)$

(ii) $\lim_{x \to 0^-} f(x)$

(iii) $\lim_{x \to 0} f(x)$

(iv) $\lim_{x \to 0^+} g(x)$

(v) $\lim_{x \to 0^-} g(x)$

(vi) $\lim_{x \to 0} g(x)$

(vii) $\lim_{x \to 0^+} (f + g)(x)$

(viii) $\lim_{x \to 0^-} (f + g)(x)$

(ix) $\lim_{x \to 0} (f + g)(x)$

(x) $\lim_{x \to 0^+} (fg)(x)$

(xi) $\lim_{x \to 0^-} (fg)(x)$

(xii) $\lim_{x \to 0} (fg)(x)$

4. Find

$$\lim_{x \to \infty} \frac{\cos x}{e^x}$$

5. Find

$$\lim_{h \to 0} \frac{\sqrt{9+h} - 3}{h}$$

6. Approximate π to one place after the decimal using bisection on the function $f(x) = \sin x$.

7. Show that $f(x) = \begin{cases} x^2 & x \geq 2 \\ 5x - 6 & x < 2 \end{cases}$ is continuous at $x = 2$.