Pledge:

You must neatly show all work on this quiz.

I. Find the indicated limits. If the limit does not exist as a number you should determine if it exists in the infinite sense. You must show all work to receive any credit. (5 points each, 25 total)

1. 
$$\lim_{t \to 0} \frac{4t + 7t^2}{8t^2 - 9t}$$

$$2. \lim_{x \to \infty} \frac{7x^3 + 4}{e^{3x}}$$

3. 
$$\lim_{\theta \to 0^+} \frac{\cos(\theta)}{\theta}$$

4. 
$$\lim_{w \to \infty} w \sin\left(\frac{3}{w}\right)$$

5. 
$$\lim_{x \to \infty} \left( \frac{x}{x+1} \right)^x$$

Pledge:

II. Use the function  $f(x) = x^4 - 4x^3$  to answer the following questions. YOU MAY NOT USE A CALCULATOR ON THIS PROBLEM. Please show all work. (25 points total)

1. What are the zeros of this function (i.e. where does it cross the x axis)? (3 points)

2. Find all critical points of the function. (5 points)

3. Determine on which intervals the function is increasing and on which intervals the function is decreasing. It would be helpful to draw a first derivative sign chart here. Clearly indicate your answers. (5 points)

4. Find all extrema (relative maxima and relative minima) of the function. For each extrama you should indicate if it is a relative max or min and why, where the extrema occurs, and its value. (5 points)

5. Draw a graph of the function on the axes provided. You should indicate all zeros, critical points, and extrema on the graph. (4 points)  $120_{\neg}$ 

6. Do you think any of the extrema you found above are absolute extrema? Why or why not? (3 points)

