Name: _____

Please show all work and justify your statements. Make and label sketches, draw conclusions (using complete sentences and including units), and box the final answers as appropriate.

1. You fall out of bed and hit the floor. Graph your altitude and speed as functions of time. Are these functions continuous? Explain.

2. Evaluate the following limits. Justify your answers.

$$\text{(a) } \lim_{x \to 0} \frac{x}{|x|} \qquad \text{(b) } \lim_{x \to \infty} \frac{1 - x^2}{1 + 2x + 3x^2}$$

3. Let $f(x) = \sqrt{x}$.

   (a) Use the definition of derivative to find f' and show that it satisfies the power rule.
   [Hint: $(\sqrt{a} - \sqrt{b})(\sqrt{a} + \sqrt{b}) = a - b$]

   (b) Find an equation for the tangent line to f at $x = 1$. Sketch.

4. On what intervals is the graph of $y = \arctan(x^2)$ concave up?

5. Find dy/dx, if $2^x \ln(y) = \cos(xy)$.

1	2	3	4	5	total (50)	%

Prelim. course grade: %