

### Practice Problems for Exam #1

1. a) How do you change the equation  $y = f(x)$  to stretch the graph vertically by a factor of 2? What would this do to the slope of the tangent line at a given  $x = a$ ?

b) If  $f(x)$  is an odd function that is differentiable and  $f'(2) = 1$ , does this tell you about the slope anywhere else?

2. The position of a particle at time  $t$  is  $f(t) = t^2 - 1$ . Find the average velocity from time  $t = 1$  to  $t = 2$ . What is the instantaneous velocity at  $t = 2$ ?

3. Evaluate the following limits.

- a)  $\lim_{x \rightarrow 1} \frac{x^2 - 1}{x + 1}$   
b)  $\lim_{x \rightarrow 1} \frac{x^2 - 1}{x^3 - 1}$   
c)  $\lim_{x \rightarrow 1^+} \frac{x^2 - 1}{(x - 1)^2}$

4. Sketch the graph of a function  $f(x)$  that has  $\lim_{x \rightarrow -1^-} f(x) = 3$ ,  $\lim_{x \rightarrow -1^+} f(x) = -2$ , has a removable discontinuity at  $x = -1$ ,  $f'(0) = -3$ , and is not differentiable at  $x = 2$ .

5. Find a  $\delta > 0$  such that for all  $x$  with  $0 < |x - 1| < \delta$ ,  $|\sqrt{x} - 1| < .01$ . What limit would you be trying to compute here?

6. For  $f(x) = x^3 + 10$ , find  $f'(-2)$  and an equation for the tangent line to the graph  $y = f(x)$  at the point where  $x = -2$ .