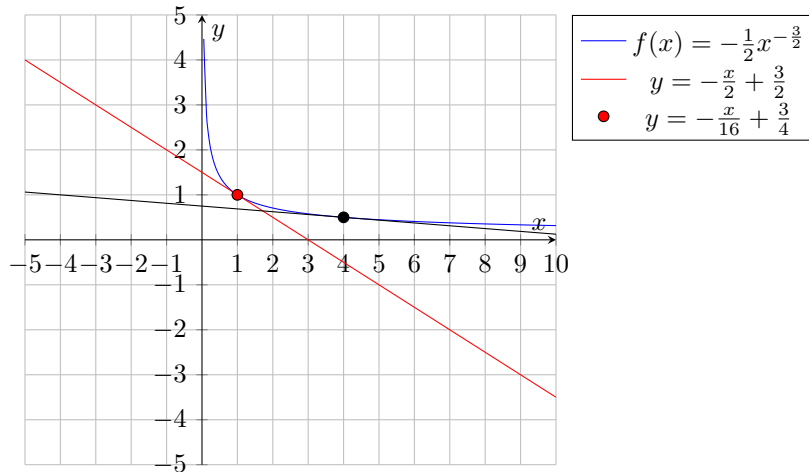


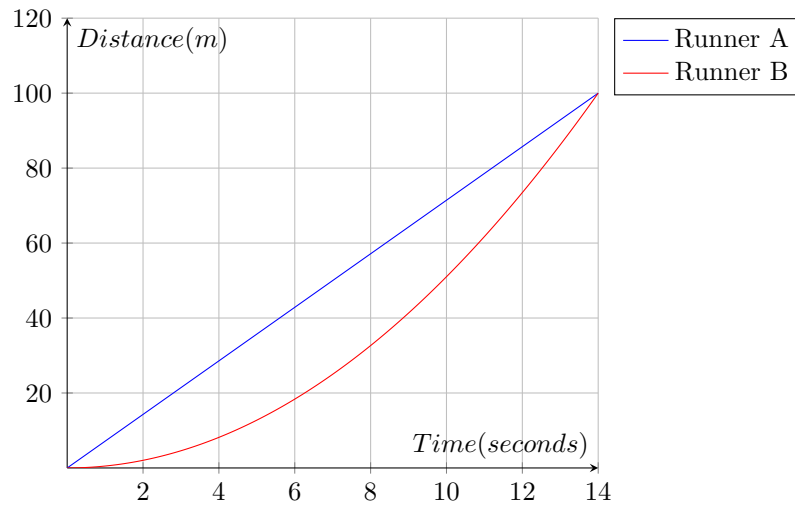
# Calc I: Worksheet 3

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

1. (a) Find the slope of the tangent to the curve at  $y = \frac{1}{\sqrt{x}}$  at the point where  $x = a$ .  
 (b) Find equations of the tangent lines at the points  $(1, 1)$  and  $(4, \frac{1}{2})$ .  
 (c) Graph the curve and both tangents on a common screen
2. The graph is below:



3. If the tangent line to the curve  $y = f(x)$  at  $(4, 3)$  passes through  $(0, 2)$ , find  $f(4)$  and  $f'(4)$ .
4. Shown are graphs of the position functions of two runners, A and B, who run a 100-m race and tie:



- (a) Describe how each of the runners ran the race.

- (b) At what time is the distance between the runners the greatest?
- (c) At what time do they have the same velocity?
5. If a ball is thrown into the air with a velocity of 40 ft/s, its height after  $t$  seconds is  $y = 40t - 16t^2$ . Find the velocity when  $t = 2$ .
6. Find  $f'(a)$ :

$$f(t) = \frac{2t + 1}{t + 3}$$

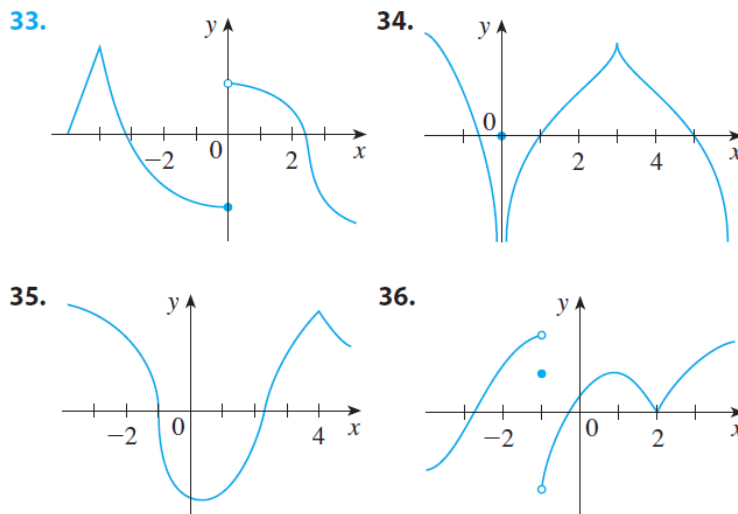
7. These limits are the derivative of a function  $f$  evaluated at  $a$ . Find  $f$  and  $a$  for each:

(a)  $\lim_{h \rightarrow 0} \frac{(1+h)^{10} - 1}{h}$

(b)  $\lim_{x \rightarrow 5} \frac{2^x - 32}{x - 5}$

(c)  $\lim_{x \rightarrow \frac{\pi}{4}} \frac{\tan(x) - 1}{x - \frac{\pi}{4}}$

8. Picture from Stewart (page 94)



For each graph (33-36, which we'll call (a)-(d)), say where and why  $f$  is not differentiable

- (a) At  $x = -4$  because there is a corner, and at  $x = 0$  due to a discontinuity.
- (b) At  $x = 0$  due to a discontinuity, at  $x = 3$  due to a cusp, and at  $x = 6$  due to a vertical line (which looks like it will be an asymptote)
- (c) At  $x = -1$  since it is a fully vertical segment, and at  $x = 4$  since there is a corner/cusp
- (d) At  $x = -1$  due to a discontinuity, and  $x = 2$  due to a cusp.
9. Prove each of the following:
- (a) The derivative of an even function is an odd function
- (b) The derivative of an odd function is an even function