

1. [5] TRUE/FALSE: Circle T in each of the following cases if the statement is *always* true. Otherwise, circle F. Let f be a function and x and y be positive numbers.

T F $\frac{1}{x} = \frac{1+3}{x+3}$

T F $\lim_{x \rightarrow 0} \cos(x) = -\sin(x)$

T F $\frac{d}{dx}(e) = e$

T F $\frac{d}{dx}(x^{-1}) = -x^{-2}$

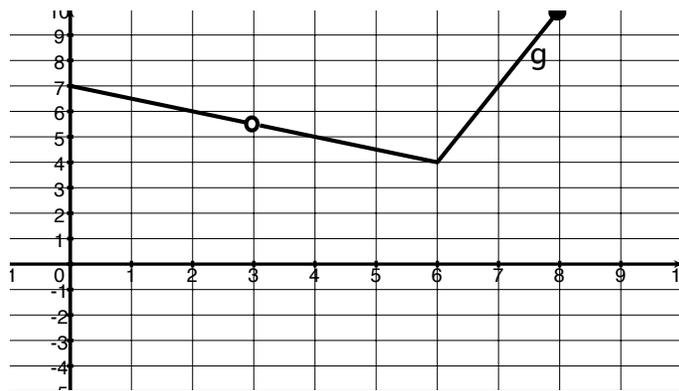
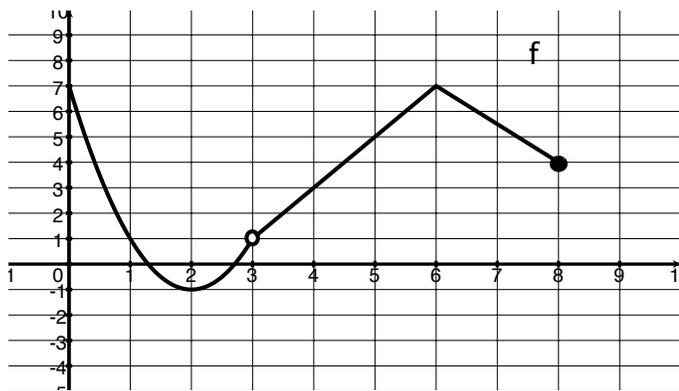
T F $\frac{d}{dy}(y) = 1$

Show your work for the following problems. The correct answer with no supporting work will receive NO credit (this includes multiple choice questions).

2. [4] Find a formula for a function f that satisfies the following criteria:
- (a) f is not differentiable when $x = 3$
 - (b) f is continuous when $x = 3$
 - (c) $f'(-3) = 0$

3. [3] (Quiz 3 #1) Find the *limit*: $\lim_{x \rightarrow 0} \frac{\sin(6x)}{\cos(6x) \sin(2x)}$

4. [8] Let the graph of f and g be those shown below.



Estimate the following (if they exist):

[2] (§3.2 #44)
 $(5f - 4g)'(1)$

[2] (DerivativeWks)
 $(f \cdot g)'(4)$

[3] (§3.4 #65)
 $(f \circ g)'(4)$

[3] (WebHW8 #10)
 $\left(\frac{f}{g}\right)'(3)$

5. [14] Find the derivatives of the following and do *not* simplify.

[3] (WebHW8 #1)

$$y = 5e^x \sqrt{x}$$

[3] (PracticeExam #6)

$$y = \frac{\sin(x) + x^2 \cos(x)}{\cos(x)}$$

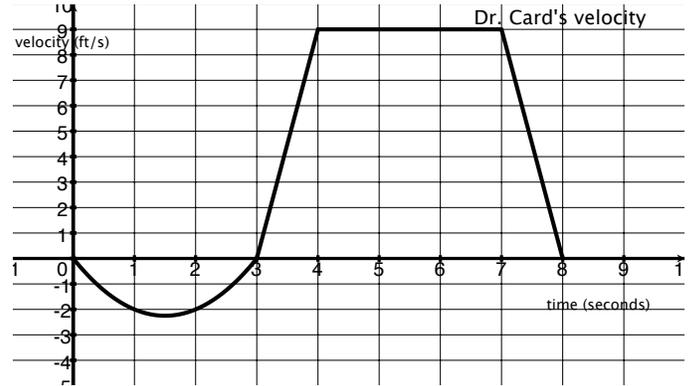
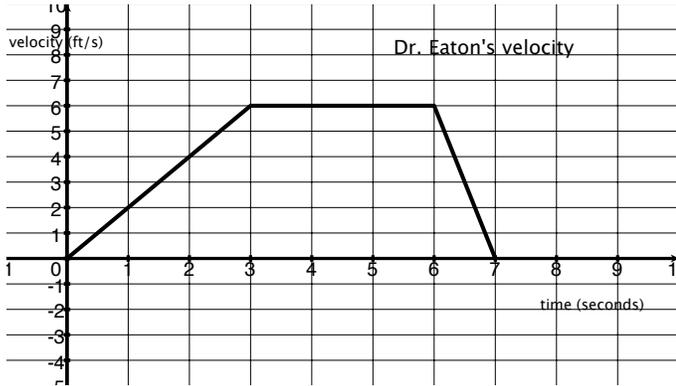
[4] (DiffPractice Wks)

$$y = x^2 y^3 + x^3 y^2$$

[4] (§3.4 #24)

$$y = 10^{1-x^2}$$

6. (Word Problem Wks #4) Dr. Card and Dr. Eaton decide to have a short race. The following is a graph of their respective *velocities* at time t measured in seconds.



- (a) [2] Who can run faster? What is his/her top speed?
- (b) [2] Both are stationary at the start of the race. What other times are Dr. Card & Dr. Eaton at rest?
- (c) [1] When is Dr. Card running the wrong way?
- (d) [1] What is Dr. Eaton decelerating?
7. [3] (Exp Wks #2) Consider $f(x) = e^x + \frac{1}{x}$. Find the equation of the line tangent to the graph of f when $x = 1$.

8. [5] Choose *ONE* of the following. Clearly identify which of the two you are answering and what work you want to be considered for credit.

No, doing both questions will not earn you extra credit.

- (a) (Story Problem Worksheet #3) A cylindrical tank with radius 5m is being filled with water. The height of the water seems to be increasing at a rate of 5cm/min. Find the rate that water is being added to the tank.
- (b) (§3.9 Example 2) A ladder 10 ft long rests against a vertical wall. If the bottom of the ladder slides away from the wall at a rate of 1 ft/s, how fast is the angle between the ladder and the ground changing when the bottom of the ladder is 6ft from the wall?