Name:_____ Date:_____

Related Rates Review

1. Assume that oil spilled from a ruptured tanker spreads in a circular pattern whose radius increases at a constant rate of 2 ft/sec. How fast is the area of the spill increasing when the radius of the spill is 60 ft?

2. A cylindrical tank with radius of 6 meters is filling with a fluid at a rate of 108π cubic meters per second. How fast is the height increasing?

3. A rocket is rising vertically at 800ft/sec. At the instant when the rocket is 4000 feet high, how fast must a camera's elevation angle change to keep the rocket in sight if the camera is 3000 ft away from the launching pad?

4. An underground conical tank, standing on its vertex, is being filled with water at a rate of 18π cubic feet per minute. If the tank has a height of 30 feet and a radius of 25 feet, how fast is the water level rising when the water is 12 feet deep?

5. One end of a 25-foot ladder is on the floor, and the other rests on a vertical wall. When the bottom of the ladder is 15 feet from the wall, the bottom end of the ladder is drawn away from the wall at 4 feet per second:

   a. How fast is the top of the ladder sliding down the wall at that moment?

   b. How fast is the angle of elevation of the ladder changing at that moment?

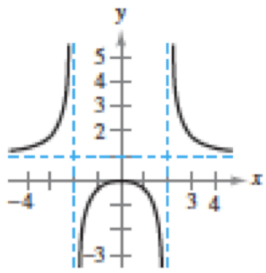
   c. At what rate is the area of the triangle formed by the ladder, wall and ground changing at that moment?

Name:_____ Date:_____

Continuity Review

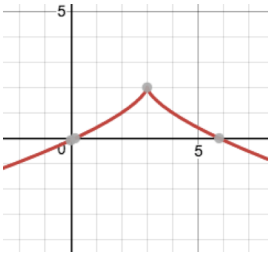
1. Describe the x-values at which the graph of the function $f(x)=\dfrac{x^2}{x^2-4}$

(A) $f(x)$ is differentiable on the interval (-2, 2)
(B) $f(x)$ is differentiable everywhere except x = ± 2.
(C) $f(x)$ is differentiable everywhere.
(D) $f(x)$ is differentiable at x = -2 and x = 2.



2. Describe the x-values at which the graph of the function $f(x)=-(x-3)^{2/3}+2$

(A) $f(x)$ is differentiable everywhere.
(B) $f(x)$ is differentiable everywhere except x = 0 and 6.
(C) $f(x)$ is differentiable everywhere except x =0, 3, and 6.
(D) $f(x)$ is differentiable everywhere except x = 3.



3. Describe the x-values at which the graph of the function is differentiable.

$f(x)=\dfrac{2}{x+3}$

$f(x)=|x^2-4|$

$f(x)=|x-5|$

$f(x)=\sqrt{x-2}$

$f(x)=(x+4)^{2/3}$

4. Examine the function function *f (x)* below.

$$f(x)=\begin{cases} x+1\ , & x\le 1 \\ 3x-1\ , & x>1 \end{cases}$$

   a. Sketch the graph of f.
   b. Determine if *f (x)* is continuous at x = 1. Show you work.
   c. Determine if *f (x)* is differentiable at x = 1. Show your work.

5. Examine the function function *f (x)* below.

$$f(x)=\begin{cases} x^2-1, & x\le 2 \\ 3x-3\ , & x>2 \end{cases}$$

   a. Sketch the graph of f.
   b. Determine if *f (x)* is continuous at x = 2. Show you work.
   c. Determine if *f (x)* is differentiable at x = 2. Show your work.

6. Given: $f(x)=\begin{cases} 3x^2 & x \geq 2 \\ cx+4, & x<2 \end{cases}$, find the value(s) of c that makes f(x) continuous everywhere?

7. Given: $f(x)=\begin{cases} cx+1, & x \leq 1 \\ -x+4, & x>1 \end{cases}$, find the value(s) of c that makes f(x) continuous everywhere?

8. Given: $f(x)=\begin{cases} 3x^2+4x, & x \leq 1 \\ 2x^2+bx+c, & x>1 \end{cases}$, find the value(s) of b and c that makes f(x) continuous everywhere?

9. Examine the function $f(x) = -\frac{1}{2}x^2 + x + 4$.
   a. Explain why the function *f (x)* has a zero ($f(c) = 0$) in the given closed interval [2, 6].

   b. Find the value c such that $f(c) = 0$.

10. Consider the function $v(t) = x^2 + 3x + 4$ with the initial condition x(0) = - 2. Explain why the function *x(t)* has a zero in the given closed interval [0, 1].