Math 2310 - Test 2 Version 2

Name:_____

Do not use a calculator and show all work.

1. Graph the derivative function of the graph of the function given below.

2. Compute the derivatives of the following functions:

$f(x) = x^2$	$f(x) = \sec(x^2)$
$f(x) = \ln(x^2 + 1)$	$f(x) = \frac{x+3}{x^3+1}$
$f(x) = \sin(\cos(x))$	$f(x) = \sin(x)\cos(x)$
$f(x) = \sin(\arctan(x))$	$f(x) = \frac{x-1+x^{3/2}}{x}$

3. Let $s(t) = -4.9t^2 + 19.6t + 3$ represent the height above the ground of a baseball I threw up in the air.

   (a) Compute the velocity as a function of time.

   (b) When is the velocity zero?

   (c) What is the maximum height of the ball?

4. Use logarithmic differentation to compute the following derivative

$$f(x) = (\tan(x))^{3x^2 \cos(x)}.$$

5. Use implicit differentiaion to determine the derivative $\frac{dy}{dx}$ for

$$y^2 + y^3 - xy^2 = 8x.$$

Then use the derivative to compute the equation of the line tangent to the function at the point $(1, 2)$.

6. A canoe is travelling downstream at 6 ft per second. The canoe is in the center of the stream and we are at a perpandicular distance of 8 feet from the center of the stream. The canoe is 12 feet downstream from the center of the stream directly in front of us. How fast is the canoe travelling away from us?

7. A spherical ballon is shrinking (ay leaking out). The radius is decreasing at a rate of 2 inches per second when the radius of the ballon is 7 inches. How fast is the air leaking out of the ballon (in volume)?

TAKE HOME. There are many legends surrounding the first president of the United States, some true some maybe not so true. One such legend is that George Washington threw a rock from the ground to the top of the Natural Bridge in Virginia (look up pictures on google maps very pretty), a vertical distance of 215 feet. Ignoring air resistance and noting that a modern professional pitcher can throw a ball at 90 miles an hour, argue the possible validity of this legend (of course using calculus).

To start note that $s(t) = -16t^2 + v_0 t$ is the equation of the height (in feet) of an object thrown directly upward on earth, where v_0 is the initial velocity (in feet per second). Your job is to determine the initial velocity so that the maximum height is at least 215 feet. Then convert your initial velocity into miles per hour and compare to the 90 miles per hour.