Calculus I Exam Two

Name: _____

Please show all work on these problems. Use of a calculator is permitted.

1. Find the tangent line to $f(x) = x^2$ at (3,9) using the definition of derivative (using limits).

2. Differentiate $f(x) = 3x^5 + \frac{9}{2x^4} - 4\sqrt{x} + \frac{2}{x\sqrt{x}} + \pi^2$.

3. The position of a particle at time *t* is $s(t) = e^t \sin(t)$. Find the velocity and acceleration of the particle at time *t*.

4. If
$$y = \frac{12x^2}{7 + \ln(x)}$$
 find y'.

5. Differentiate $f(x) = 5\cos^7(4x + \csc x)$.

6. Find $\frac{d}{dx}(\sin(x) - 8)^3(\cos(x) + 6)^5$.

7. Find the tangent line to the hyperbola $x^2 + 2xy - y^2 + x = 2$ at (1, 2).

8. The graph of f is given below.



(a) Find all points where f is not continuous.

(b) Find all points where f is not differentiable.

9. The graph of g is given below. Sketch the graph of g'.



10. At noon, two airplanes leave an airport. The first travels North at 200 mph, while the other plane travels East at 300 mph. How fast is the distance between them increasing 3 hours later?