## Calculus I Exam Two

Name: $\qquad$

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 $f(x)=3 x^{5}+\frac{9}{2 x^{4}}-4 \sqrt{x}+\frac{2}{x \sqrt{x}}+\pi^{2}$.
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 $y=\frac{12 x^{2}}{7+\ln (x)}$ find $y^{\prime}$.
5. Differentiate $f(x)=5 \cos ^{7}(4 x+\csc x)$.
6. Find $\frac{d}{d x}(\sin (x)-8)^{3}(\cos (x)+6)^{5}$.
7. Find the tangent line to the hyperbola $x^{2}+2 x y-y^{2}+x=2$ 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 $g^{\prime}$.

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?
