

Exam 1
No Work = No Credit!

1. Let $f(x) = \frac{1}{x+3}$. Find the derivative using the limit definition. Be careful with your notation. **7 points**

2. Find all points on the graph of the curve $f(x) = x^3 - 4x^2 + 5x - 3$ where there is a horizontal tangent line. **6 points**

3. Find each derivative. You do not need to simplify. **5 points each**

a) $\ln(xy) = x^2 + y^2$

b) $y = \sin(\ln x^2)$

c) $y = \arccos(e^{-x^2})$

d) $y = \frac{x^2}{\sqrt{x^2 - x}}$

e) $y = \csc(3x)$

4. Find y'' for $y = \sec(5x)$. **6 points**

5. Find the equation of the a) tangent line and b) normal line to the curve $x^3 + y^3 - 9xy = 0$ at the point $(2, 4)$. **10 points**

6. Prove that the product of an even function and an odd function is an odd function. **4 points**

7. Find each of the following limits. **4 points each**

a) $\lim_{x \rightarrow 1} \frac{1 - \sqrt{x}}{1 - x}$

b) $\lim_{x \rightarrow \pi^-} \csc x$

c) $\lim_{x \rightarrow 4} \frac{x^2 - x - 12}{x^2 - 11x + 28}$

d) $\lim_{x \rightarrow 0} \frac{\sin(x)}{5x}$

8. Given this table and the fact that $Q(x) = \frac{f(x)}{g(x)}$ and $R(x) = f \circ g(x)$, find a) $Q'(6)$ and b) $R'(9)$. **10 points**

x	$f(x)$	$g(x)$	$f'(x)$	$g'(x)$
6	10	5	-2	-11
8	3	-4	7	15
9	20	8	-3	-30

9. By differentiating $x^2 - y^2 = 1$ implicitly, show that $y' = \frac{x}{y}$. Then show that

$$y'' = -\frac{1}{y^3}. \quad \mathbf{8 \text{ points}}$$

10. Are there any points on the curve $y = x - e^{-x}$ where the slope is 2? If so find them. **8 points**