

MA 125 CT, CALCULUS I

Test 1, February 2, 2015

Name (Print last name first):

Show all your work and justify your answer!

No partial credit will be given for the answer only!
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PART I

You must simplify your answer when possible.

All problems in Part I are 7 points each.

1. Use the **definition** of the derivative to show that if $f(x) = x^2$, then $f'(x) = 2x$.

2. Evaluate $\lim_{x \rightarrow 3} \frac{\sin(x)}{x + 1}$

3. Evaluate $\lim_{x \rightarrow \infty} \frac{x^5 + 3x^2 - 7}{-2x^5 + 4x^3 - x^2 - 6}$

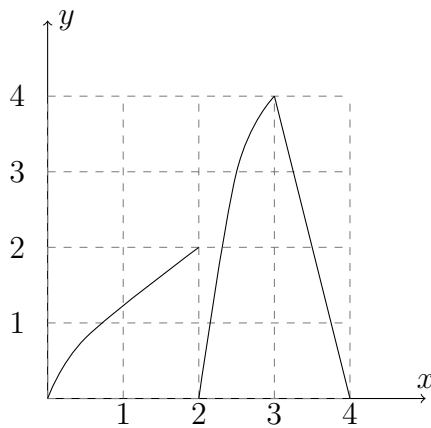
4. Given that $y = f(x) = x^2(x^3 + \sqrt{x})$, find $f'(x)$.

5. Given that $y = f(x) = x^3 \cos(x)$, find $f'(x)$.

6. Given that $y = f(x) = \frac{x^2+1}{x^2-1}$, find $f'(x)$.
7. Find the equation of the tangent line to the graph of $y = f(x) = \sqrt{x}$ at the point $x = 4$.
8. Evaluate $\lim_{x \rightarrow 2} \frac{x^2 - 4}{x^2 + x - 6}$

9. If the position of a particle, at time t , is given by $S(t) = 4t^3 + 2t$, find the acceleration at time $t = -1$. Is at that time the **velocity** $v(t)$ increasing or decreasing? Justify your answer.

10. Given the graph of the function below, state (a) where it is continuous and (b) where the derivative exist.



PART II

All problems in Part II are 10 points each.

1. Evaluate

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

$$(b) \lim_{x \rightarrow 0} \frac{1 - \cos^2(x)}{x}$$

2. Evaluate $\lim_{x \rightarrow \infty} (\sqrt{9x^2 + x} - 3x)$

3. Below you are given the graph of the **derivative** $f'(x)$ of a function $y = f(x)$.

(a) State the x -coordinates of all points where the graph of $y = f(x)$ has a horizontal tangent line.

(b) State all x -values of points where the rate of change of the function $y = f(x)$ is maximal.

Graph of the derivative $f'(x)$

