

I certify that I did not use my calculator for data storage or symbolic manipulation.

Total:

Name:

Math 125

First Exam

Fall 2006

Write neat and concise solutions to each of the problems below—I will not give partial credit for steps I cannot follow. Include all relevant details and use correct notation. Problems that have the symbol **(S)** should end with a complete sentence. Each problem is worth 6 points.

1. State the definition of the derivative of a function f (the full version).
2. Prove that a function f is continuous at c if it is differentiable at c .
3. Use the definition of the derivative to find the derivative of the function f defined by $f(x) = \sqrt{x}$.
4. Explain carefully (using mathematical ideas we have discussed so far in the course) why the polynomial P defined by $P(x) = x^7 + 3x^4 + 4x - 5$ has a root in the interval $[0, 1]$.
5. **(S)** The position s in meters of a particle at time t seconds is given by $s = \frac{5t + 2}{10 - t}$. Find the velocity of the particle when $t = 8$ seconds. Your answer should include appropriate units.
6. **(S)** Suppose that the height $h(t)$ in feet of a beanstalk after t hours is $h(t) = 19t + \frac{1}{24t^2}$. When is the rate of growth of the beanstalk one foot per hour? Your answer should include appropriate units.
7. **(S)** Find (using calculus) the maximum output of the function $f(x) = x\sqrt{9 - x^2}$ on the interval $[0, 3]$.
8. Use algebra to evaluate $\lim_{x \rightarrow 3} \frac{\frac{1}{9} - \frac{1}{x^2}}{x - 3}$.
9. **(S)** Find the x -intercept of the line normal to the graph of $y = x^2$ when $x = 3$.
10. Your writing will be graded carefully on this problem! Write the solution in the manner expected of your turned in homework assignments.

Find all of the values of x for which the curve $y = x^2(x - 6)^4$ has a horizontal tangent line.

60, 58, 56, 55³, 54, 53², 50², 49², 48, 46², 45³, 43², 42², 41, 38, 36, 34, 33², 32, 31², 30, 28², 20, 19

52–60 (9)

44–51 (10)

36–43 (7)

28–35 (9)

0–27 (2)