

You have 20 minutes to take this quiz. Each problem will be graded for clarity of work as well as correctness, so show all work **clearly and in order**. Circle or otherwise indicate your final answers. Please note that there are problems on both the front and the back of this page.

**1. (6 points) [Similar to #22, 4.1]**

Show that the equation  $6x^5 + 13x + 1 = 0$  has exactly one real root. Make sure that your argument is clear and that you use both Rolle's Theorem and the Intermediate Value Theorem.

**2. (6 points) [Similar to #13, 4.2]**

Use the derivative to find the intervals on which the function  $f(x) = |x - 5|$  is increasing and the intervals on which the function is decreasing. Show your work clearly and in order.

**3.** (8 points) [Similar to #26, 3.8]

Water is poured into a reservoir in the shape of a cone 6 feet tall with a radius of 4 feet. If the water level is rising at the constant rate of 0.5 feet per second, how fast is the water being poured in at the instant the depth is 2 feet? Be sure to show all work and set up the problem clearly. If I can't follow your work you will not get full credit (even if your final answer is correct).

*You may or may not need the following formulae: A cone with radius  $r$  and height  $h$  has volume  $V = \frac{1}{3}\pi r^2 h$  and total surface area  $S = \pi r^2 + \pi r\sqrt{r^2 + h^2}$ .*