Instructions: You must show all work to receive full credit for the problems below. You may check your work with a calculator, but answers without work will receive minimal credit. Use exact answers unless the problem starts with decimals or you are specifically asked to round.

- 1. Green Mountain Coffee Roasters produces many varieties of flavored coffees, teas and K-cups. The net sales S of the company have grown exponentially at the rate of 37.2% per year, and the growth can be approximated by $\frac{dS}{dt} = 0.372S$, where t is the number of years since 2005.
 - a. Find the function that satisfies the equation, given that net sales in 2005 were approximately \$150,800.
 - b. Estimate the net sales in 2008, 2010, 2019.
 - c. What is the doubling time for S(t)?
- 2. Iodine-131 has a decay rate of 9.6% per day. The rate of change of an amount N of iodine-131 is given by $\frac{dN}{dt} = -0.096N$, where t is the number of days since the decay began. Suppose that 500 g of idione-131 was initially present.
 - a. What is the equation that models the amount of iodine?

- b. How much will remain after 4 days?
- c. After how many days will half of original 500 g of iodine-131 remain?

3. The elasticity of demand is given by $E(x) = -\frac{xD'(x)}{D(x)}$. Find the elasticity for $D(x) = 300e^{-0.15x}$, at x = 10.

4. Integrate $\int \frac{2}{x} - 7e^{4x} + \sqrt{x^5} dx$.