Supplementary Related Rates Problems

Name:

---

1. *From Calculus for the Life Sciences by Greenwell, Ritchey and Lial; Example 5.* Blood flows faster the closer it is to the center of a blood vessel because of the reduced friction with cell walls. According to Poiseuille's laws, the velocity V of blood is given by

$$V = k(R^2 - r^2),$$

where R is the radius of the blood vessel, r is the distance of a layer of blood flow from the center of the vessel, and k is a constant, assumed here to equal 375. Suppose a skier's blood vessel has radius $R = 0.08$ millimeter and that cold weather is causing the vessel to contract at a rate of $dR/dt = -0.01$ millimeter per minute. How fast is the velocity of the blood changing?

2. *From Calculus for the Life Sciences by Greenwell, Ritchey and Lial; Problem 17.* Sociologists have found that crime rates are influenced by temperature. In a midwestern town of $100,000$ people, the crime rate has been approximated as

$$C = \frac{1}{10}(T - 60)^2 + 100,$$

where C is the number of crimes per month and T is the average monthly temperature in degrees Fahrenheit. The average temperature for May was 76°, and by the end of May the temperature was rising at the rate of 8° per month. How fast is the crime rate rising at the end of May?