

Integral Word Problems

1. The marginal profit of manufacturing and selling a flu vaccine is given by $P'(x) = 1000 - 0.04x$, where x is the number of units of vaccine sold. How much profit should the company expect if it sells 20,000 units of this vaccine?
2. On June 24, 2012 the changes in temperature of Des Plaines, IL, from 6 a.m. to 10 p.m. are represented by $f(t) = 3\cos\left(\frac{t}{3}\right)$ degrees Fahrenheit, where t is number of hours elapsed after 6 a.m. Using your calculator, if at 6 a.m. the temperature is 75°F , find the temperature at 1 p.m.
3. A full water tank begins to leak. The rate of leaking water can be approximated by $f(t) = 7e^{-0.1t} + 5$ gal/h, where t is measured in hours. After 12 h, the tank is half empty. Using your calculator, how much water did the full tank contain before it started leaking?
4. The price of stock in Abercrombie and Fitch on February 4th, 2011 from 9 a.m. to 3 p.m. is approximated by the function $f(t) = \frac{x^2}{4} + 2$, where t is the number of hours after 9 a.m., when the stock exchange opens. Is there a time during the day when the value of stock is equal to its average value for the entire day? If yes, at what time?
5. The amount of bacteria in a petri disk increases at a rate proportional to the amount of bacteria present. An initial amount of bacteria is placed in the dish, and shortly after they begin to multiply. Using your calculator, if there are 200 bacteria after one day in the dish, and 600 bacteria after the 3 days in the dish, how many bacteria are in the petri dish after the 7 days?
6. The temperature of your coffee decreases according to the equation $\frac{dy}{dt} = ky$ with t measured in minutes. If after 5 min the temperature decreases by 70%, then $k = ?$
7. The rate of growth of the wolf population in Yosemite National Park is proportional to the population. The wolf population increased by 11% between 2002 and 2011. What is the constant of proportionality?
8. Write an equation for the curve that passes through the point (2,11) and whose slope is $\frac{4xy}{2x^2+3}$.
9. If $\frac{d^2y}{dx^2} = 4x - 5$ and when $x = 0, y' = 3$ and $y = 4$ find a solution of the differential equation.