Quiz

Directions: Carefully read each question below and answer to the best of your ability in the space provided. You **MUST** show your work to receive full credit!

1. (5 points) Suppose \$6,000 is invested at an annual interest rate of 6% compounded continuously. How long will it take for the original investment to double in value (i.e. \$12,000)?

Solution: Letting $A(t)$ be the function for the value of the investment after t years, since the interest is compounded continuously, the function $A(t)$ is given by

$$A(t) = Pe^{rt},$$

where P is the principal (initial) amount invested, so $P = 6,000$.

Thus, from the problem, we have that

$$\begin{aligned} 12,000 &= 6,000e^{0.06t} \\ 2 &= e^{0.06t} \\ \ln(2) &= 0.06t \\ t &= \frac{\ln(2)}{0.06} \\ &\approx 11.55\text{years.} \end{aligned}$$

2. (5 points) A spherical balloon is being filled at a rate of 80 ft^3/min. How fast is the radius increasing, when the radius is 5 feet? Remember that the volume of a sphere is

$$V = \frac{4}{3}\pi r^3.$$

Solution: First thing that we need to notice is that the radius of our spherical balloon is not a constant and depends on t. Therefore, when we take derivative of volume of balloon with respect to t, we need to use chain rule, such as

$$\frac{dV}{dt} = \frac{4}{3} \cdot 3 \cdot \pi \cdot r^2 \cdot \frac{dr}{dt} = 4\pi r^2 \boxed{\frac{dr}{dt}}$$

The problem asks us to determine how fast the radius increasing, when the radius is 5 feet and balloon is being filled at a rate of 80 ft^3/min, so we need to solve the above for $\frac{dr}{dt}$ and substitute known values. So we have

$$\frac{dr}{dt} = \frac{\frac{dV}{dt}}{4\pi r^2} = \frac{80}{4\pi 5^2} = \frac{4}{5\pi}\ ft/min.$$

Name: ____

Section (circle one): 021 022 023 024

Question:	1	2	Total
Points:	5	5	10
Score:			