MAT 1800
Exponential Growth/Decay Supplemental Problems with Solutions

1. A substance grows exponentially according to the function \( n(t) = n_0 \alpha^t \), where \( n(t) \) is the quantity after \( t \) hours and \( n_0 \) is the original quantity. If the substance grows from 400 grams to 600 grams in 2 hours, how many will be present after 4 hours?

\[ \text{Solution:} \quad 900 \text{ grams} \]

2. A bacterial culture grows exponentially according to the function \( n(t) = n_0 \alpha^t \), where \( n(t) \) is the quantity after \( t \) hours and \( n_0 \) is the original quantity. If the culture grows from 2 grams to 128 grams in 3 hours, how many grams were there after 2 hours?

\[ \text{Solution:} \quad 32 \text{ grams} \]

3. A bacterial culture grows exponentially according to the function \( n(t) = n_0 \alpha^t \), where \( n(t) \) is the quantity after \( t \) hours and \( n_0 \) is the original quantity. If the culture grows from 20 bacteria to 45 bacteria in 2 days, how many bacteria will there be in 5 days?

\[ \text{Solution:} \quad \frac{5}{8} \cdot (3)^3 = 151.875 \text{ bacteria} \]

4. A radioactive substance has a half-life of 8 years. If 200 grams are present initially, how much will remain at the end of 12 years?

\[ \text{Solution:} \quad 200 \cdot \left(\frac{1}{2}\right)^{\frac{12}{8}} = 70.711 \text{ grams} \]

5. A bacterial culture grows exponentially according to the function \( n(t) = n_0 \alpha^t \), where \( n(t) \) is the quantity after \( t \) hours and \( n_0 \) is the original quantity. If the culture grows from 100 grams to 800 grams in 3 hours, how many grams will there be in 4 hours?

\[ \text{Solution:} \quad 1600 \text{ grams} \]

6. The amount of money, \( A(t) \), in a savings account after \( t \) years of continuously compounding interest is given by the function \( A(t) = A_0 e^{rt} \). Suppose that the money in the account grew from $100 to $800 in 5 years. How much money would be in the account after 4 years?

\[ \text{Solution:} \quad \$1600 \]