

1-7 Applied Calculus Solutions

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1. A population numbers 11,000 organisms initially and grows by 8.5% each year. Write an exponential model for the population.

Let $P(t)$ = population after t years.

$$\text{Then, } P(t) = 11000e^{.085t}$$

3. A vehicle purchased for \$32,500 depreciates at a constant rate of 5% each year. Determine the approximate value of the vehicle 12 years after purchase.

Let $V(t)$ = the value of the vehicle t years after purchase.

$$\begin{aligned} V(t) &= 32,500e^{-.05t} \\ \Rightarrow V(12) &= 32500e^{-.05(12)} = 32500e^{-0.6} \\ \therefore \boxed{V(12) \approx \$17,836} \end{aligned}$$

5. If \$4,000 is invested in a bank account at an interest rate of 7 per cent per year, find the amount in the bank after 9 years if interest is compounded annually, quarterly, monthly, and continuously.

Let A_1 = amount in the account after 9 years at 7% interest per year,

compounded annually.

$$A_1 = 4000(1 + .07)^9 \approx \$7353$$

Let A_4 = amount in the account after 9 years at 7% interest per year,

compounded quarterly.

$$A_4 = 4000 \left(1 + \frac{.07}{4}\right)^{9 \times 4} = 4000 \left(1 + \frac{.07}{4}\right)^{36} \approx \$7470$$

Let A_{12} = amount in the account after 9 years at 7% interest per year,

compounded monthly.

$$A_{12} = 4000 \left(1 + \frac{.07}{12}\right)^{9 \times 12} = 4000 \left(1 + \frac{.07}{12}\right)^{108} \approx \$7497$$

Let A_c = amount in the account after 9 years at 7% interest per year,
compounded continuously.

$$A_c = 4000e^{.07(9)} = 4000e^{0.63} \approx \$7510$$

These solutions were created by Donald R. Goral from exercises in *Applied Calculus, Edition 1* by Shana Calaway, Dale Hoffman, David Lippman

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