1) The value of a car $y$ (in thousands of dollars) can be approximated by the model $y = 31(0.92)^t$, where $t$ is the number of years since the car was new. Estimate when the value of the car will be $9600$?

\[ y = 1.6 \times 1.0176^t \]
\[ y = 1.6(1.0176)^9 \]
\[ y = 1.87 \text{ million} \]

$\text{2009-2000}$

2) In 2000, the population of a city was about 1.04 million. During the next 14 years, the population increased by about 2.05% each year. Write an exponential growth model giving the population (in millions) $t$ years after 2000. Estimate the city’s population in 2008.

\[ y = 31(0.92)^t \]
\[ 0.6 = 31(0.92)^t \]
\[ \frac{0.6}{31} = (0.92)^t \]
\[ \log_{0.92} 0.31 = t \]
\[ t = \frac{\log 0.31}{\log 0.92} \]
\[ t \approx 14.05 \approx 14 \]
\[ 14 \text{ years later} \]
3) In 2000, the population of a city was about 1.04 million. During the next 14 years, the population increased by about 2.05% each year. Write an exponential growth model giving the population (in millions) t years after 2000. Estimate the year when the city’s population was 1.3 million.

\[
y = 1.04 \left(1.0205\right)^t
\]

\[
y = 1.04 \left(1.0205\right)^8
\]

\[
y = 1.22
\]

\[
1.22 \text{ million}
\]

4) The amount, in grams, of the radioactive isotope barium-140 remaining after t days is \(y = a(0.5)^{\frac{t}{15}}\), where \(a\) is the initial amount in grams. What percent of the barium-14 decays each day?

\[
y = 1.04 \left(1.0205\right)^t
\]

\[
1.3 = 1.04 \left(1.0205\right)^t
\]

\[
1.25 = \left(1.0205\right)^t
\]

\[
\log_{1.0205} 1.25 = t
\]

\[
t = \frac{\log_{1.25} \log_{1.0205}}{15}
\]

\[
t = 10.99 \approx 11 \text{ years}
\]

\[
2000 + 11
\]

\[
2011
\]
5) You deposit $8600 into an account that pays 1.32% annual interest. Find the balance after 4 years when the interest is compounded quarterly.

\[ y = a \left( 0.95 \right)^{t/13} \]

6) You deposit $8600 into an account that pays 1.32% annual interest. Find the balance after 4 years when the interest is compounded daily.

\[ A = p \left( 1 + \frac{r}{n} \right)^{nt} \]
\[ A = 8600 \left( 1 + \frac{0.0132}{4} \right)^{4 \cdot 4} \]
\[ A = 9065.49 \]
7) The value of a car (in thousands) can be approximated by the model \( y = 24(0.83)^t \). Estimate when the value of the car will be $6500.

\[
A = p\left(1 + \frac{r}{n}\right)^{nt}
\]
\[
A = 8600\left(1 + \frac{0.0132}{365}\right)^{365\cdot 4}
\]
\[
A = 9066.27
\]

8) In 2000, the population of a city was about 1.6 million. During the next 15 years, the population increase by about 1.76% each year. Write an exponential growth model giving the population \( y \) (in millions) \( t \) years after 2000. Estimate the city’s population in 2009.

\[
y = 24(0.83)^t
\]
\[
\frac{65}{24} = 24(0.83)^t
\]
\[
0.271 = 0.83^t
\]
\[
t = \frac{\log 0.271}{\log 0.83}
\]
\[
t = 7.01 \approx 7
\]

after 7 years