

(36)

Exponential Growth

An exponential growth occurs when a quantity increases by the same rate in a period of time

$$y = a(1+r)^t \rightarrow \text{time}$$

total amount initial value rate

ex) The original value of a painting is \$9,000 and the value increases by 7% each year. Write an exponential function to model this situation. Then find the painting's value in 15 years.

$$y = 9000(1 + 0.07)^{15}$$
$$y = \$24,831.28$$

ex) A sculpture is increasing value at a rate of 8% per year, and its value in 2000 was \$1200. Write an exponential function to model this situation. Then find the sculpture's value in 2006.

$$y = 1200(1 + 0.08)^6$$
$$y = \$1,904.25$$

A common application of exponential growth is compound interest.

Compound Interest is the interest earned or paid on both the principal & previously earned interest.

$$A = P \left(1 + \frac{r}{n} \right)^{nt}$$

$\downarrow$ total amount $\downarrow$ initial value $\begin{matrix} \nearrow \text{rate} \\ \downarrow \end{matrix}$ $\begin{matrix} n \rightarrow \text{time} \\ \downarrow \end{matrix}$ compounded amount

Compounded Amount

"n" represents the amount the money is compounded

- annually - 1 time a year
- biannually - 2 times a year
- quarterly - 4 times a year
- monthly - 12 times a year

Ex) Joe invested \$1200 at a rate of 2% and it is compounded quarterly. How much money will Joe have after 3 years? $A = 1200 \left(1 + \frac{0.02}{4}\right)^{4(3)}$

$$A = 1200 \left(1 + \frac{0.02}{4} \right)^{4(3)}$$
$$A = \$1274.01$$

ex) Matt invested \$14,700 at a rate of 3.5% and it is compounded annually. How much money will Matt have after 8 years?

$$A = 14700(1 + \frac{.035}{1})^{1(8)}$$

$$a = 14700(1 + \frac{.035}{1})^{118}$$
$$a = \$19,357.09$$