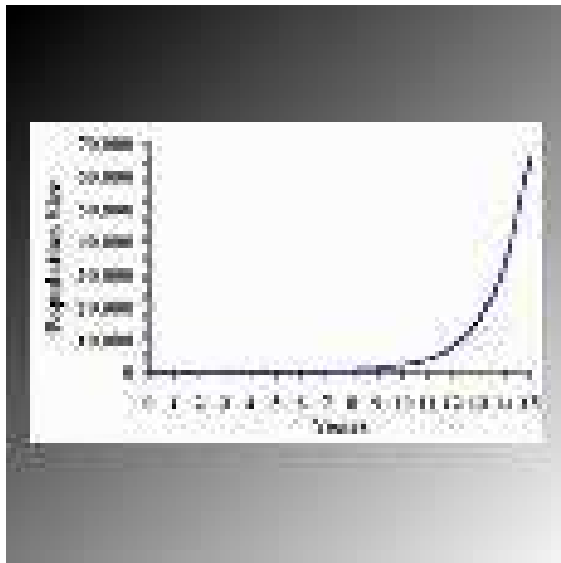
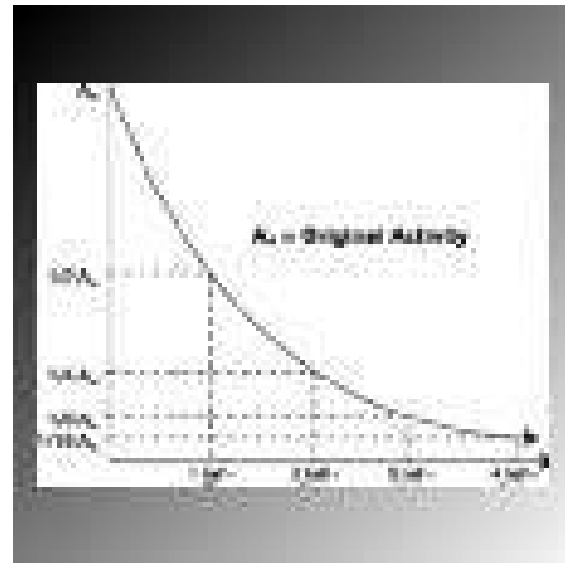


Exponential Functions

Growth



Decay



Exponential Growth

If a quantity increases by the same proportion r in each unit of time, then the quantity displays exponential growth and can be modeled by the equation

$$y = C(1 + r)^t$$

Where

C = initial amount

r = growth rate (percent written as a decimal)

t = time

Example: Compound Interest

You deposit \$1500 in an account that pays 2.3% interest compounded yearly,

- 1) What was the initial principal (**P**) invested?
- 2) What is the growth rate (**r**)? The growth factor?
- 3) Using the equation **$A = P(1+r)^t$** , how much money would you have after 2 years if you didn't deposit

any more money?

- 1) The initial principal (**P**) is \$1500.
- 2) The growth rate (**r**) is 0.023. The growth factor is

3) $A = P(1+r)^t$

$$A = 1500(1 + 0.023)^2$$

$$A = \$1569.79$$

Exponential Decay Functions

If a quantity decreases by the same proportion r in each unit of time, then the quantity displays exponential decay and can be modeled by the equation

$$y = C(1 - r)^t$$

Where

C = initial amount

r = growth rate (percent written as a decimal)

t = time

Example: Exponential Decay

You buy a new car for \$22,500. The car depreciates at the rate of 7% per year,

- 1) What was the initial amount invested?
- 2) What is the decay rate? The decay factor?
- 3) What will the car be worth after the first year? The second year?

1) The initial investment was \$22,500.

2) The decay rate is 0.07. The decay factor is 0.93.

$$3) \quad y = C(1 - r)^t \qquad y = C(1 - r)^t$$

$$y = 22,500(1 - 0.07)^1 \quad y = 22,500(1 - 0.07)^2$$

$$y = \$20,925 \qquad y = \$19,460.25$$

You Try It

- 1) Your business had a profit of \$25,000 in 1998. If the profit increased by 12% each year, what would your expected profit be in the year 2010? Identify **C, t, and r.** Write down the equation you would use and solve.
- 2) Iodine-131 is a radioactive isotope used in medicine. Its half-life or decay rate of 50% is 8 days. If a patient is given 25mg of iodine-131, how much would be left after 32 days or 4 half-lives. Identify C, t, r and r. Write down the equation you would use and solve.

Problem 1

$$C = \$25,000$$

$$T = 12$$

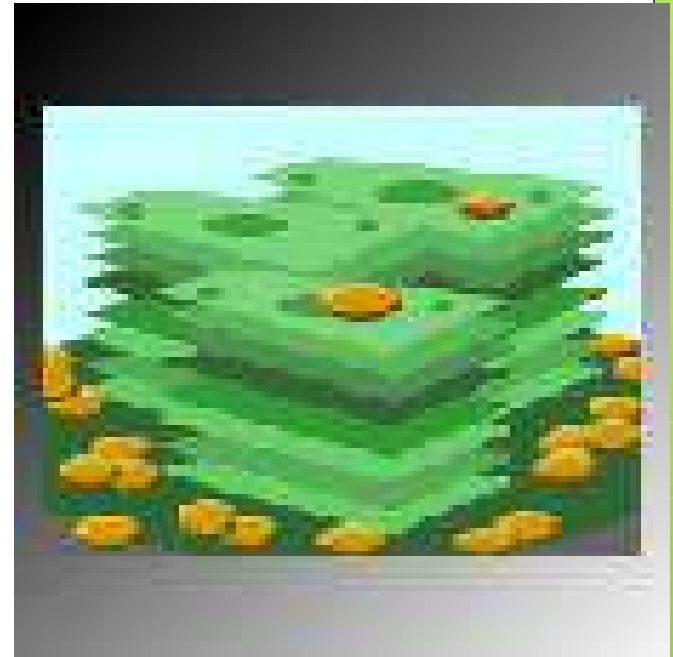
$$R = 0.12$$

$$y = C(1 + r)^t$$

$$y = \$25,000(1 + 0.12)^{12}$$

$$y = \$25,000(1.12)^{12}$$

$$y = \$97,399.40$$



Problem 2

$$C = 25 \text{ mg}$$

$$T = 4$$

$$R = 0.5$$

$$y = C(1 - r)^t$$

$$y = 25\text{mg}(1 - 0.5)^4$$

$$y = 25\text{mg}(0.5)^4$$

$$y = 1.56\text{mg}$$