

8.1/8.2 Exponential Growth and Decay Models

growth: $y = a(1+r)^t$

a = initial amount

r = % increase or decrease (decimal)

decay: $y = a(1-r)^t$

$1+r$ = growth factor

$1-r$ = decay factor

t = time

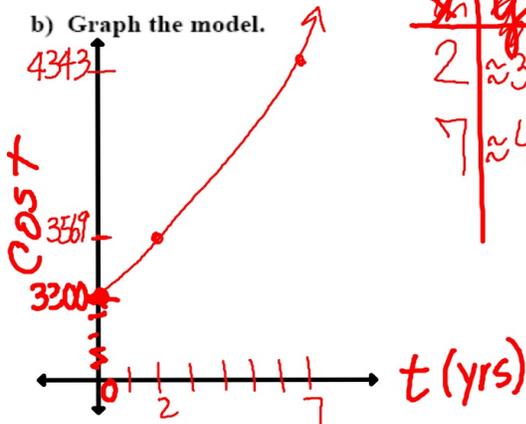
y = amount after time t has passed

Example 1: In 2000, the cost of tuition at a state university was \$3300 per year. Over the next 11 years, tuition rose by 4% per year.

a) Write a model for the cost (C) of tuition t years after 2000.

$$C = 3300(1.04)^t$$

b) Graph the model.



c) Find the approximate cost of tuition in 2011.

$$C = 3300(1.04)^{11}$$

$$C \approx \$5080$$

t	C
0	3300
2	≈ 3569
7	≈ 4343

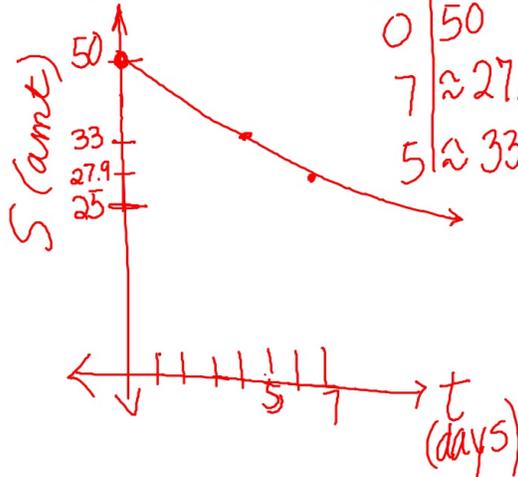
Example 2: Eight percent of a 50 gm sample of Iodine-131 decays each day.

a) Write a model for the amount (S) remaining after t days.

$$r = .08$$

$$S = 50(.92)^t$$

b) Graph the model.



c) After how many days will only one-half of the original amount remain?

$$25 = 50(.92)^t$$

$$.5 = .92^t$$

> 8 days

Example 3: Compound Interest

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

P = principal (amount invested)
 r = annual interest rate (decimal)
 n = number of times per year that interest is compounded (paid)
 compounded annually $n = 1$
 compounded semiannually $n = 2$
 compounded quarterly $n = 4$
 compounded monthly $n = 12$
 compounded daily $n = 365$
 t = time (in years) money is invested

If you invest \$2000 at 1.5% annual interest rate, compounded quarterly for 2 years, how much will the investment be worth at the end of the 2 year period?

$$A = 2000 \left(1 + \left(\frac{.015}{4} \right) \right)^{2(4)}$$

$$A \approx \$2060.79$$