Interest

$C = P(1+r)^t$ "growth"

$C = P(1-r)^t$ decay

P = starting amt

C = current amount

r = interest rate or just rate

t = time

* rate and t have to be the same units.

Ex 1

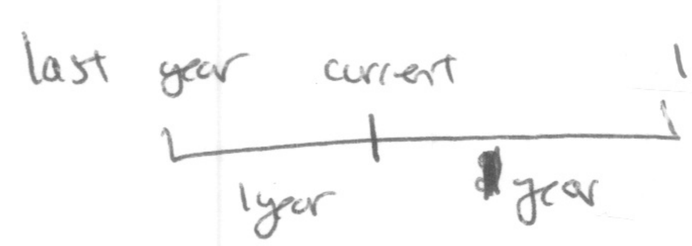
Rate is 5% annual and you keep it in the bank for 36 months. How much do you have? (You start with $100)

$$100(1+0.05)^{3}$$

- 5% per year
- not 36 because the time needs to be in years to match rate.

Ex 2

If last year a car costs 28,000 and in one years from now it is $ 26891.2 what is the rate of depriciation?



2 total years of time between 2 prices

$$26891.20 = 28{,}000(1-r)^2$$

can't distribute because PEMDAS Exponent before multiplication

$$\frac{26891.20}{28{,}000} = (1-r)^2$$

$$\sqrt{0.9604} = 1-r$$

$$.98 - 1 = -r \qquad r = 0.02$$

2%

Compound Interest

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

P = start amount
C = current amount
r = rate per time (i.e. years)
t = time in the same units as rate.
n = # of "sections" each time unit is broken into (i.e. years → months ∴ n = 12)

Ex 1 Credit card interest rate is 22%

Assume that the interest is compounded monthly, how much money do you owe if you didn't pay your bill for 6 months? You borrowed $1000.

If not stated assume interest is an annual one

yearly interest rate

t is in years to match interest rate.

$$C = 1000\left(1 + \frac{0.22}{12}\right)^{12(t)}$$

$$C = 1000\left(1 + 0.018\overline{3}\right)^{12 \cdot \left(\frac{6}{12}\text{ years}\right)}$$

monthly interest rate now and the power $n \cdot t \to 12t$ converts t years into months

$$C = 1000\left(1 + 0.018\overline{3}\right)^{6}$$

$$C = \$1115.167$$

Ex 2

You are putting money into a bank the has an interest rate of 1.7% and is compounded daily. At the end of 2.4 years how much money do you have? (you put in $3000)

$$C = 3000\left(1 + \frac{1.7}{365}\right)^{365 \cdot 2.4}$$

(n : t)

convert the years into days to match time unit of interest rate

converts yearly interest into daily interest rate

$$C = 3000\ (1.004657)^{876} = \$175,681.81$$

Continuously compounded (use natural #, e)

$$C = Pe^{(rt)}$$ ← in calculator use ( )

Ex3 Same info as Ex2 but make it compound continuously

$$C = Pe^{rt} = 3000\ e^{(1.7 \cdot 2.4)}$$

remember the units of time needs to be the same

1.7 % in years

2.4 years

$$= \$177436.41$$