1. What does the absolute value mean? $|x|$

$$|x| = \begin{cases} -x & x < 0 \\ x & x \geq 0 \end{cases}$$

2. Equation of a circle $(x-h)^2 + (y-k)^2 = r^2$ (h,k) is the center point and r is the radius

3. Solve for x: $\dfrac{x^3 + x^2 - 20x}{x+4} = 0$

   NEVER DIVIDE BY THE VARIABLE YOU ARE SOLVING FOR.

   $x(x+5)(x-4) = 0$

   $\boxed{x = -5 \quad x = 4 \quad x = 0}$

4. Simplify: $\dfrac{x^3 + x^2 - 20x}{x+5}$

   $= \dfrac{x(x+5)(x-4)}{x+5} = x(x-4)$

5. A table of values represents a linear function, $y = mx + b$,

   a. if the slope between any two points are the same. $m = \dfrac{y_2 - y_1}{x_2 - x_1} = \dfrac{y_3 - y_2}{x_3 - x_2}$

   b. if the increments between the x's are the same $x_2 - x_1 = x_3 - x_2$ and if the different between the y's are the same $y_2 - y_1 = y_3 - y_2$.

   $\boxed{y_2 - y_1 = slope \text{ only if } x_2 - x_1 = 1}$

6. A table of values represents an exponential function, $y = Ca^x$,

   a. if $a = {}^{(x_2 - x_1)}\!\sqrt{\dfrac{y_2}{y_1}} = {}^{(x_3 - x_2)}\!\sqrt{\dfrac{y_2}{y_1}}$

   b. if the x's are the equally spaces $x_2 - x_1 = x_3 - x_2$ and if the ratios of the y's are the same $\dfrac{y_2}{y_1} = \dfrac{y_3}{y_2}$.

   $\boxed{\dfrac{y_2}{y_1} = a \text{ only if } x_2 - x_1 = 1}$

7. Solve for x: $x^2 = 9$

   $|x| = 3$

   $x = \pm 3$

8. Simplify: $\sqrt{9}$ the answer is **3**.

Hint #1
Story Problems r = rate of growth or decay
  If r is given as a percentage then the equation is exponential
  If r is given as a number per ____ (not a percentage) then the equation is linear.
If the problem says one of the following:

1. if growth is exponential with a rate of r, then use $P = P_o a^t$ where $a = 1+r$

2. if decay is exponential with a rate of r, then use $P = P_o a^t$ where $a = 1-r$

3. if it is a **<u>continuous</u>** growth rate of r, then use $P = P_o e^{kt}$ where $k = r$

4. if it is a **<u>continuous</u>** decay rate of r, then use $P = P_o e^{-kt}$ where $k = r$

Only use formulas 3 and 4 if the word <mark>continuous</mark> is in the word problem

Examples in Story problems
The garbage grows in the apartment at the following rates. The apartment started with 5 lbs of garbage.

a) Increases 3 lbs per day   (linear growth) $f(t) = 3t + 5$ t is in days

b) Increase 3% per day   (exponential) $g(t) = 5(1.03)^t$ t is in days

c) Increasing continuously 3% per day   (exponential) $k(t) = 5e^{.03t}$ t is in days

Hint #2 Writing sinusoidal functions (sine and cosine functions)
  When given a graph or a table and you are asked to write a possible sinusoidal function.
You know it is in one of these two forms
$$g(t) = A\sin((B(t - C)) + D \quad \text{or} \quad f(t) = A\cos((B(t - C)) + D$$
Goal is to write the function either as sine or cosine function, if possible, with no phase shift
assume A>0

1.   If the maximum value is given at $t=0$ then use $g(t) = A\cos((Bt) + D$

2.   If the minimum value is given at $t=0$ then use $g(t) = -A\cos(Bt) + D$

3.   If the midline value is given at $t=0$ and the function is increasing then use $g(t) = A\sin(Bt) + D$

4.   If the midline value is given at $t=0$ and the function is decreasing then use $g(t) = -A\sin(Bt) + D$

5.   If the value at $t=0$ is not one of the above you will have a phase shift, choose min, max or
      midline value to write the equation with a phase shift

A is amplitude $A = \dfrac{Max - Min}{2}$ or Max – Midline or Midline – Min

B is angular frequency $B = \dfrac{2\pi}{period}$

C is the phase shift

D is the midline (average) $D = \dfrac{Max + Min}{2}$