PreCalc 12 Chp 5 Review

Note Title 2013-09-29

Formulas:

If problem involves time: $P(t) = P_0 r^{kt}$ (1/time interval)

If given value is not at time $t=0$: $P(t) = P_i r^{k(t-t_i)}$

If compound interest: $A(t) = A_0\left(1 + \frac{i}{n}\right)^{nt}$

If problem doesn't involve time: $Y(n) = Y_0 r^n$

If given value is not at $n=0$: $Y(n) = Y_i r^{(n-n_i)}$

$r = 1 \pm$ change. or r = rate. if % divide by 100.
If $0<r<1$ then decay else $r>1$ is growth.

H.A. is $y=k$. for $y = cr^{d(x-h)} + k$
Transforms: $(x, y) \to (x/d + h, cy + k)$
Simple exponentials are always incr/decr, but not both.

Remember Power Tables & Rules.

Finally, word problems: okay to use decimals but think about appropriate rounding - up/down/nearest.

Make sure you know when to use all the properties.

$c = a^b \iff \log_a c = b$

$\log b = \log_{10} b$

$\log_b 1 = 0$ for any $b > 0$, $b \neq 1$

$\log_b b = 1$

$\log a + \log b = \log(ab)$

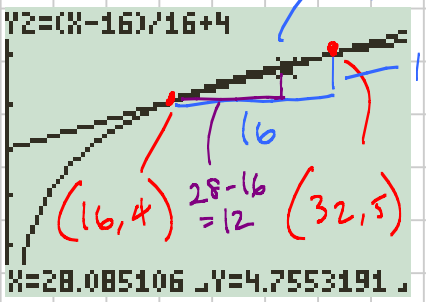
$\log a - \log b = \log(a/b)$

$\log a^b = b \log a$

$\log_a a^x = x$

$\log_b x = \dfrac{\log x}{\log b} = \dfrac{\log_a x}{\log_a b}$ $\quad a, b, x > 0;\ a, b \neq 1$

Linear Interpolation (Another look)



Similar Triangles.

Bottom of triangle:

$y = 4$

Height of triangle $= 1$

2) Estimate $\log_2 28$.

$\log_2 16 = 4$ $\quad \log_2 32 = 5$

$\text{slope} = \dfrac{5-4}{32-16} = \dfrac{1}{16}$

$(x, y) = \left(28,\ 4 + \frac{1}{16}(28-16)\right)$

$= \left(28,\ 4 + \frac{12}{16}\right)$

$= \left(28,\ 4\frac{3}{4}\right)$

$\log_2 28 \sim 4\frac{3}{4} = 4.75$

Transformations: just as before for any transform.

$y = \log_a x \Rightarrow y = c \log_a(d(x-h)) + k$, $a > 0$, $a \neq 1$, $c, d \neq 0$

+'ve h right, +'ve k up, $|c| > 1$ v. stretch, $|d| > 1$ h. comp.

$(x, y) \Rightarrow (x', y') = \left(\frac{x}{d} + h,\ cy + k\right)$

Since log and exp fns are inverses of each other, Sometimes it is easier to use the inverse fn to solve the problem; especially if you are doing algebraically! Always check for extraneous values

Sometimes you will HAVE to use the inverse; such as when there are no common base.

When you have logs and constants, convert constants to logs of powers, eg. $3 = \log_4 4^3$

Future Value: $FV = \frac{PMT\left[(1+i)^n - 1\right]}{i}$

For memorizing, think of PV starts at zero, so FV grows so this is a savings formula.

Present Value: $PV = \frac{PMT\left[1 - (1+i)^{-n}\right]}{i}$

For memorizing, think of FV will be zero because you are paying off a loan so this is a borrowing formula.

i - is the interest rate per compounding period
n - is the number of payments
This is a simplified version because compounding must match the payment period.

Other Problems:

Earthquakes: $M = \log\left(\frac{I}{S}\right)$ — M: magnitude; I: intensity; S: standard earthquake

Sound Levels: $L = 10\log\left(\frac{I}{I_0}\right)$ — L: decibels; I: intensity; I_0: min sound level

Alkalinity: $pH = -\log\left(a_{H^+}\right)$ — a_{H^+}: hydrogen concentration.

Music: $Freq = Freq_0\, 2^{n/12}$ — n: the semitone #