PreCalc 12 Final Review Chp 5

Note Title 2016-05-27

5.1) Exponentials - a^x — variable is in the exponent
base, 'a' is constant not a var
- $a>0$, $x \in \mathbb{R}$, Range >0

- When $a>1$, exp grows - grows faster than polynomials.
- $0<a<1$, exp decays
- HA: $y=0$ (untransformed)

5.2) Transforms: $f(x)=a^x$ $\quad y = c\,f(d(x-h))+k$

$y = c\,a^{d(x-h)}+k$

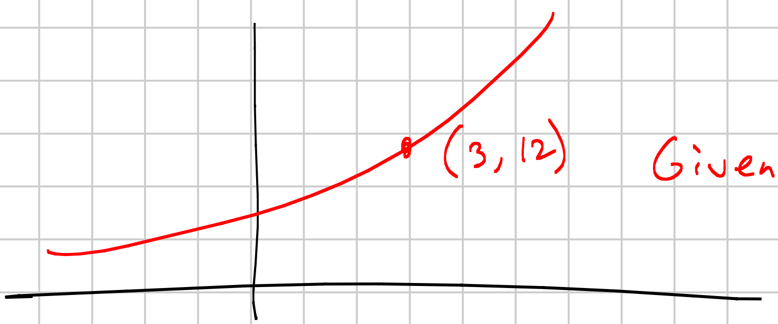
Easiest point to transform: $x=0$ (y-int) $(0,1)$

$y(t) = y_0 r^{kt}$ $\qquad y(t) = y_p r^{k(t-t_p)}$

y-int. $\qquad (t_p, y_p)$ some point on exp curve

like slope-int form $\qquad$ like point-slope form

$y - y_0 = m(x - x_0)$



Given $r = 1.5$ $\quad k = 1$

$y(t) = 12(1.5)^{t-3}$

- $y(t)$, y_0 it's okay to be a percentage.
- If r is given as a percent, it needs to be changed to a number. (ie $\div 100$)
- Important: when given a rate, determine if it is a change (by) or a value (to). If (by) then add or sub from 100%

5.3) Solving $\qquad$ eg) $2^x = 4^{x-3}$

$2^x = 2^{2(x-3)} \Rightarrow x = 2(x-3)$

- make base the same, then equate exponents.
- use logs or use calculator - beware of x-int or intersection
- avoid round intermediate calculations
- do all algebra then enter into calculator.

5.4) Logarithms are used to determine exponents, ie. a variable in the exponent. $c = b^a \Leftrightarrow \log_b c = a$

$y = \log_b x$ – D: $x > 0$; R: $y \in \mathbb{R}$, $b > 0$ & $b \neq 1$

VA: $x = 0$ (untransformed)

Changing base: $\log_3 70 = \frac{\log 70}{\log 3}$

Do linear interpolation instead of benchmarks.

5.5) Log Laws:

$\log_a x + \log_a y = \log_a xy$

$\log_a x - \log_a y = \log_a x/y$

$\log_a x^k = k \log_a x$

$\log_b x = \frac{\log_a x}{\log_a b}$

$\log_a a = 1$

$\log_a a^x = x$

Determine log if given some log values:

- factor out 10 first, then factor out given logs.
- recall $\log 10 = 1$

5.6) Transforms: $f(x) = \log_a x$

$y = cf(d(x-h)) + k$

$y = c \log_a (d(x-h)) + k$.

Easiest point to transform: x-int $\rightarrow \log_a 1 = 0$ $(1, 0)$

5.7) Solving Exp & Log Equations. – Check logs for extraneous.

For exp eqns with no common base or constants, use logs to solve for exact answers. eg) $5^x = 150$

For log eqns with constants, simplify logs first then use exp to solve for exact answers.

eg) $\log_2 x + \log_2 (x+3) = 4$

$\log_2 (x^2 + 3x) = 4$

$x^2 + 3x = 2^4$ ...

5.8) Financials – choose proper eqn.

Compound Interest (lump sum at beginning):

$$A(t) = A_0(1 + i/n)^{nt}$$

i – rate (percent/100%)
n – # of compoundings
t – years.

Future Value (no lump sum)

$$FV = \frac{PMT[(1+i)^n - 1]}{i}$$

Present Value (loan)

$$PV = \frac{PMT[1 - (1+i)^{-n}]}{i}$$

i – $\frac{\text{percent}}{100\% \cdot \# \text{ compoundings}}$

n – # of payments.

years – n/# compoundings.

Check answer: $PMT \cdot n$ > loan amount
< total savings

Earthquakes: $M = \log(I/s)$

M – magnitude.
I – intensity – should be some number times 's'
s – constant

Decibels: $L = 10 \log(I/I_0)$

I – intensity – should be some number times 'I_0'

Alkalinity: $pH = -\log(a_{H+})$

a_{H+} – hydrogen concentration

lower pH is more acidic
higher pH is more alkaline

3.4 < 3.7 so more acidic

A sound is 1/4 quieter than 68 dB, what is the decibels of that sound.

$$L = 10 \log(I/I_0)$$

$$68 = 10 \log(I/I_0)$$

$$6.8 = \log(I/I_0)$$

$$I = 10^{6.8} I_0$$

$$I_n = \frac{10^{6.8} I_0}{4}$$

$$L = 10 \log\left(\frac{10^{6.8} \cancel{I_0}/4}{\cancel{I_0}}\right)$$

$$= 62 \text{ dB}$$