Recap of Logs so far.

Friday, February 9, 2018 10:02 AM

$2^4 = 16$ ✓

$2^x = 43$

Choose $\log_2$ both sides

logs were invented for this.

$\log_2 2^x = \log_2 43$

$x \cdot \cancel{\boxed{\log_2 2}} = \log_2 43$

1

$x = \frac{\log 43}{\log 2}$

$x = 5.4263$

- $\log_b b = 1$
- $\log_b 2^x = x \cdot \log_b 2$

Change of base

$\log_b A = \frac{\log A}{\log B}$

$3^x = 951$

$$\cancel{\log_3} \cancel{3}^x = \log_3 951$$

$$x = \frac{\log 951}{\log 3}$$

$$x = 6.2420$$

$$17 = .02^x$$

$$\log_{.02} 17 = \cancel{\log_{.02}} \cancel{.02}^x$$

$$\frac{\log 17}{\log .02} = x$$

$$-0.7242 = x$$

$$Y = 3^x$$

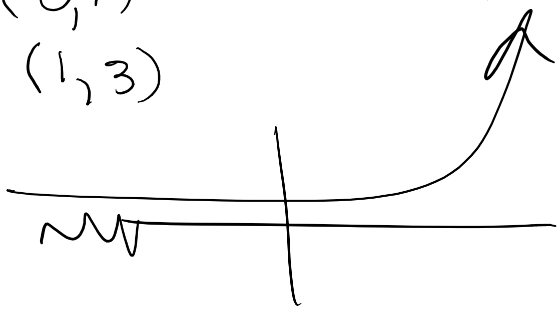
$\boxed{\begin{matrix}(0,1)\\(1,b)\end{matrix}}$

	growth	decay
$(0,1)$	$b > 1$	$0 < b < 1$

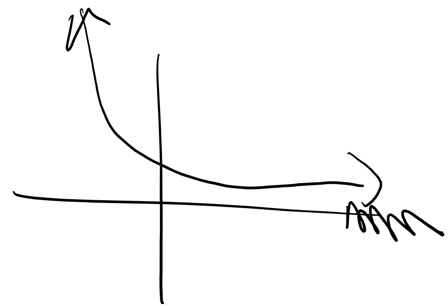
(0,1)

(1,3)

$b > 1$



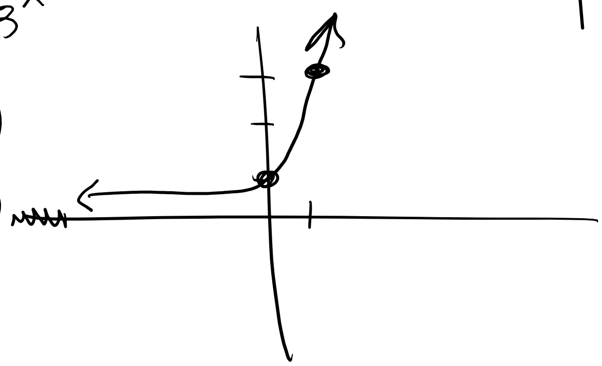
$0 < b < 1$



$y = 3^x$

(0,1)

(1,3)

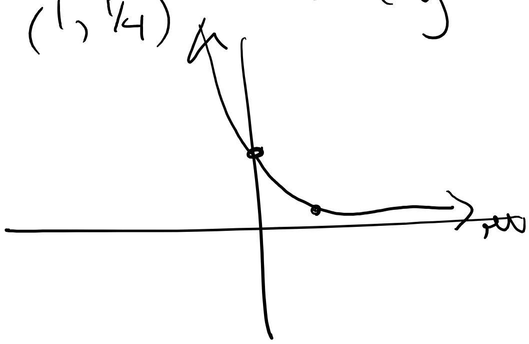


$Y = \left(\frac{1}{4}\right)^x$

(0,1)

(1, 1/4)

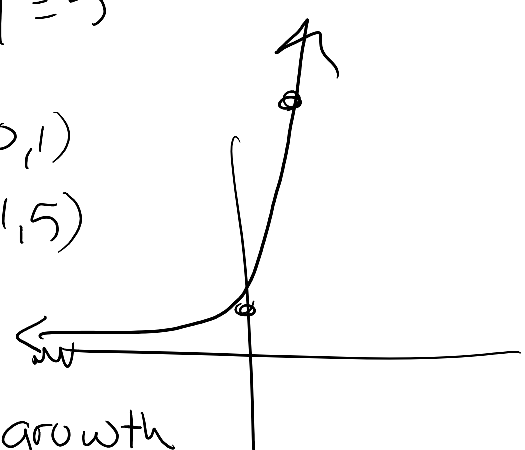
decay



$Y = 5^x$

(0,1)

(1,5)



growth

$$3^{x+7} = 27^{3x-4}$$

$$3^{x+7} = (3^3)^{3x-4}$$

$$3^{x+7} = 3^{9x-12}$$

$$x+7 = 9x-12$$

$$19 = 8x$$

$$\frac{19}{8} = x$$

$$4^{7x} = 128^{5x+6}$$

$$(2^2)^{7x} = (2^7)^{5x+6}$$

$$14x = 35x+42$$

$$-42 = 21x$$

$$-2 = x$$

$$5 = 18^x$$

$$\log_{18} 5 = \cancel{\log_{18}} 18^x$$

$\log_{18} 5 = \log_{18} 18$

$\frac{\log 5}{\log 18} = x$

$0.5568 = x$

$\log_3 7 + \log_3 10 = x$

$\log_3 70 = x$

$\boxed{\log A + \log B = \log AB}$

$\frac{\log 70}{\log 3} = x$

$\frac{1}{2} = e^{.02t}$

solve.

<u>goal</u>

$e \approx 2.718$

$$e = \lim_{n \to \infty} \left(1 + \frac{1}{n}\right)^n$$

$\log_e = \boxed{\ln}$

Lawn

log naturel

answer

$$\ln e = \log_{e} e = 1$$

base exponent

$$\ln 1 = \log_e 1 = 0$$

$$\ln 7 + \ln 10 = \ln 70$$

$$\cancel{\ln e}\ 1 \qquad \cancel{\log_e e} = 1$$

$$\log_e 7 = \ln 7$$

$$\frac{\log 7}{\log e} \qquad \ln 7 \qquad 1.9459$$

Solve:

$$\frac{1}{2} = e^{.02t}$$

ln on both sides

$$\ln\left(\frac{1}{2}\right) = \cancel{\ln e}^{.02t}$$

$$\frac{\ln(.5)}{.02} = \frac{.02t}{.02}$$

$$-34.6574 = t$$

$$\frac{57{,}000 = 10{,}000e^{.15t}}{10{,}000}$$

$$5.7 = e^{.15t} \qquad\qquad 5 = 3 \cdot 2^{5t}$$

$$5.7 = e^{.15t}$$

ln

$$5 = 3 \cdot 2^{5t}$$

3

$$\ln 5.7 = \cancel{\ln} e^{.15t}$$

$$\ln 5.7 = .15t$$

$$\frac{\ln 5.7}{.15} = t$$

$t = 11.6031$ YRS

$$A = P(1 \pm r)^t$$

$$\frac{A}{P} = (1 \pm r)^t$$

appreciation
depreciations

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

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

\$ compounding Periodically

$$A = Pe^{rt}$$

$$\frac{A}{P} = e^{rt}$$

\$
compound continuously

$$Y = ne^{kt}$$

Science

$$\frac{Y}{n} = e^{kt}$$

growth

$$A = P(1 + r)^t$$

↑ end ↑ start

Decay

$$A = P(1 - r)^t$$

guitar

$$\frac{60{,}000 = 12{,}000(1+.14)^t}{12{,}000}$$

$$5 = 1.14^t$$

$$\log_{1.14} 5 = \cancel{\log_{1.14}} \cancel{1.14}^t$$

$$\frac{\log 5}{\log 1.14} = t$$

$$\boxed{12.2831 \text{ YRS}}$$

Car 28,000

depreciates

$A = P(1-r)^t$ $\quad$ $5{,}000 = 28{,}000(1-.095)^t$

Car 20,000

depreciates

$A = P(1-r)^t$ $\quad$ $10{,}000 = 20{,}000(1-.15)^t$

Doubling Function

$$y = n\,2^t$$

end   start   double

$$y = 150 \cdot 2^{12}$$

PEMDAS

614,400

$$1{,}500{,}000 = 150 \cdot 2^t$$

Compound Interest

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

n=4 quarterly

n=52 weekly

n=12 monthly

n=365 daily

$$A = 5{,}000\left(1 + \frac{.05}{4}\right)^{4(5)}$$

$$10{,}000 = 5000\left(1 + \frac{.05}{4}\right)^{4 \cdot t}$$

Compound Continuously

$$A = Pe^{rt}$$

\$

$$y = ne^{kt}$$

science

$$A = 1{,}000\,e^{(.05)10}$$

1st!

$A = 1{,}000\,e$

$3000 = 1000\,e^{.05t}$