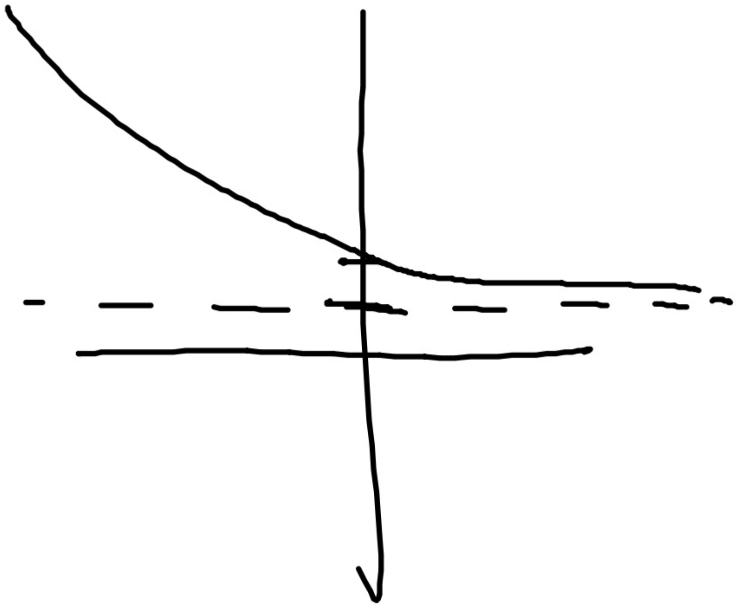
(14) $y = e^{-x} + 1$

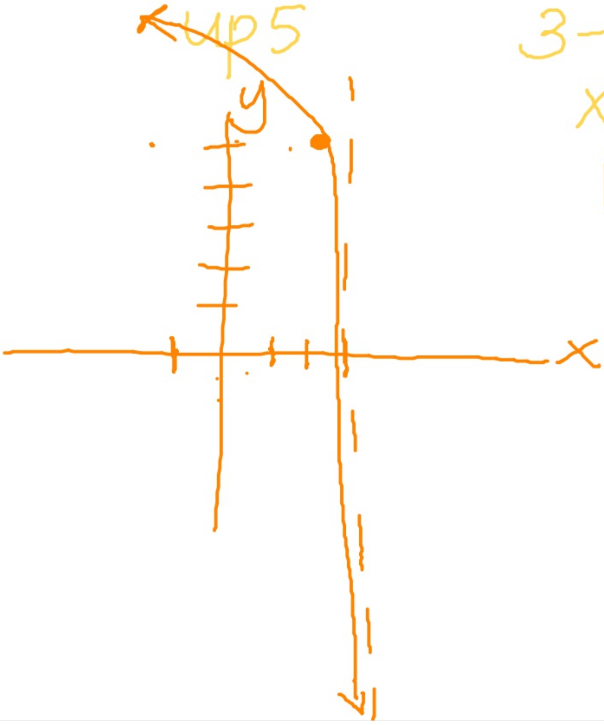
y-axis refl
up 1

$y = e^x$



⑥ $f(x) = \boxed{5} + \log_3(3-x)$ y-reflect

up 5



$3-x=0$

$x=3$

R3

VA: $x=3$

KP: $(2,5)$

D: $(-\infty, 3)$

R: $(-\infty, \infty)$

② $\log(x-1)$

$x-1=0$

$x=1$

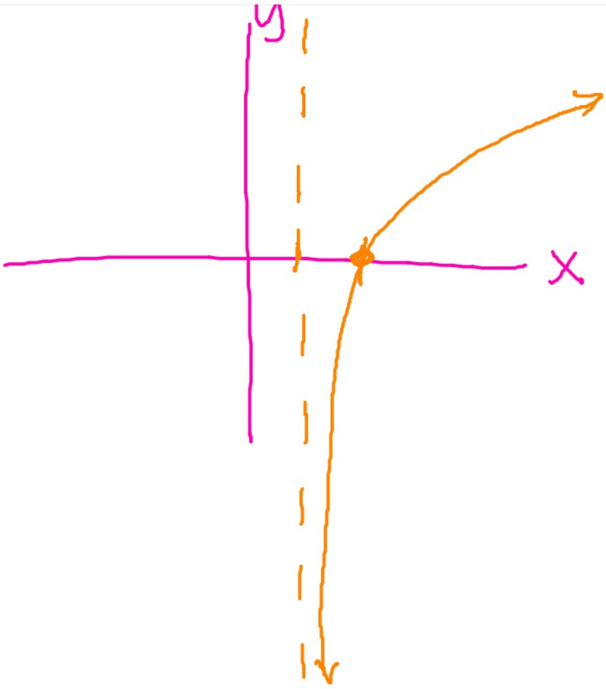
R1

VA: $x=1$

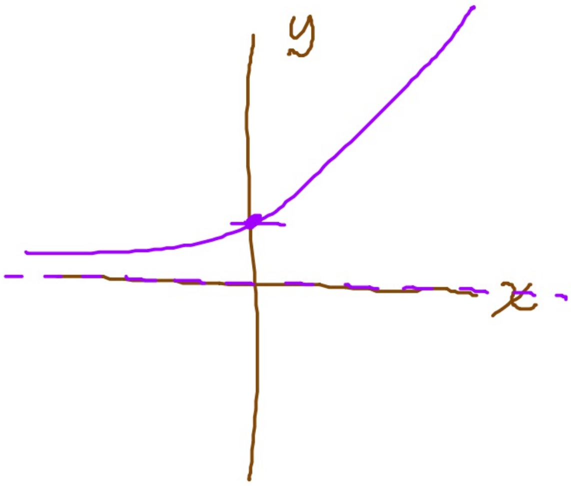
KP: $(2,0)$

D: $(1,\infty)$

R: $(-\infty,\infty)$



5 $f(x) = e^x$



HA: $y=0$

KP: $(0,1)$

D: $(-\infty,\infty)$

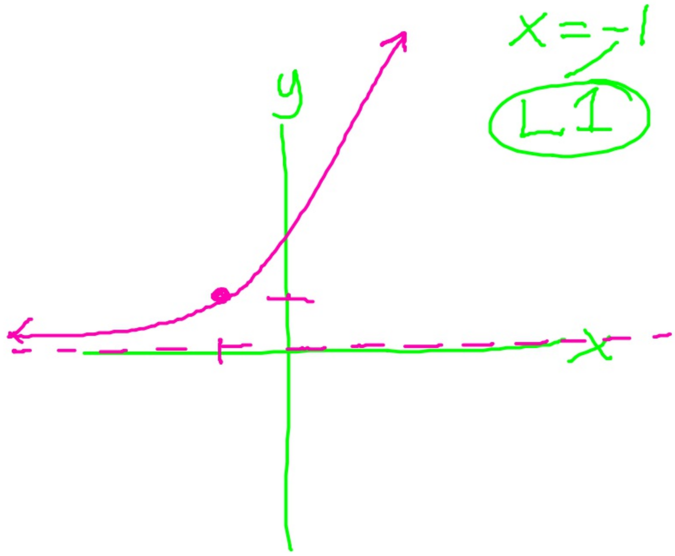
R: $(0,\infty)$

③ $f(x) = 2^{x+1}$

$x+1=0$

$x=-1$

L1



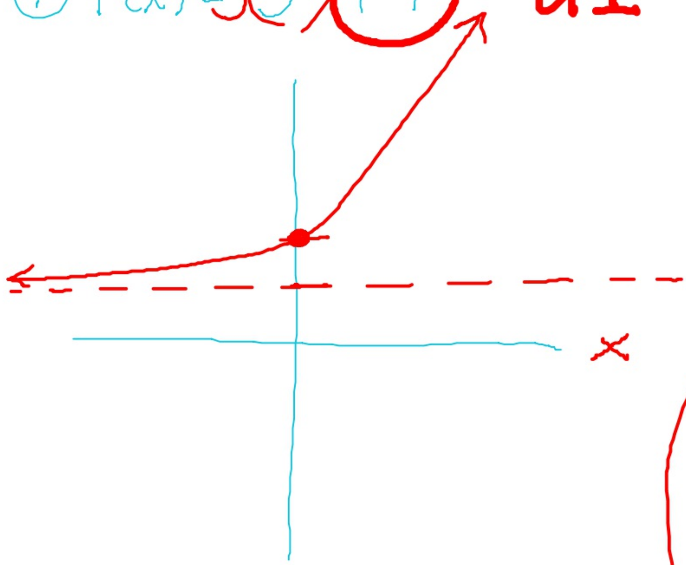
HA: $y=0$

KP: $(-1,1)$

D: $(-\infty,\infty)$

R: $(0,\infty)$

① $f(x) = 5(3^x) + 1$ **u1**



HA: $y = 1$

KP: $(0, 2)$

D: $(-\infty, \infty)$

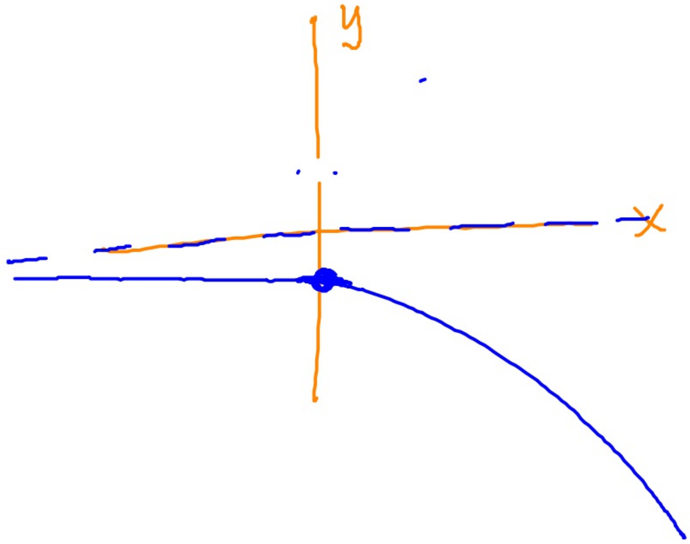
R: $(1, \infty)$

base of exp. determines how quickly the curve rises

9 $f(x) = -5^x$

x-axis refl

$(-5)^x$



HA: $y=0$

KP: $(0,-1)$

D: $(-\infty,\infty)$

R: $(-\infty,0)$

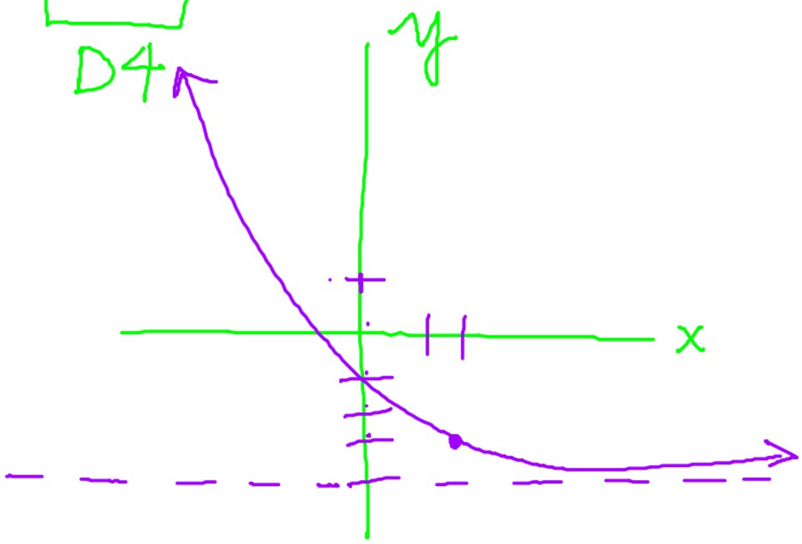
8. $f(x) = 3^{2-x} \underbrace{-4}_{D4}$ ★ reflect 1st

y-refl
(decrease)

$2-x=0$

$x=2$

R2



HA: $y=-4$

KP: $(2,-3)$

D: $(-\infty,\infty)$

R: $(-4,\infty)$

p300
#8

VS   yrefl

$$f(x) = 5\ln\underbrace{(2-x)}_{R2}-3 \rightarrow D3$$

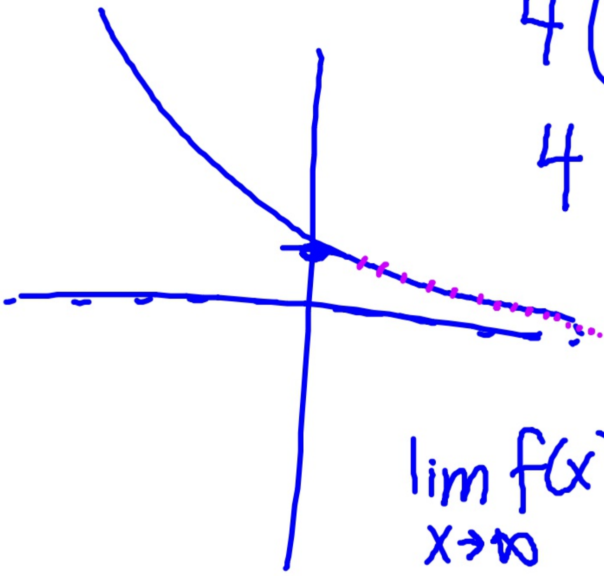
$2-x=0$
$-x=-2$
$x=2$

VA: $x=2$
KP$(1,-3)$

46

$f(x) = 4(0.5)^x$

x	y



$4\left(\frac{1}{2}\right)^x$

$4(2^{-1})^x$

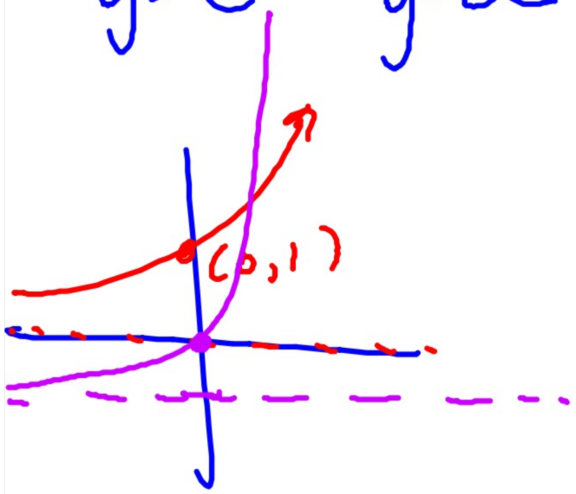
$4(2)^{-x}$

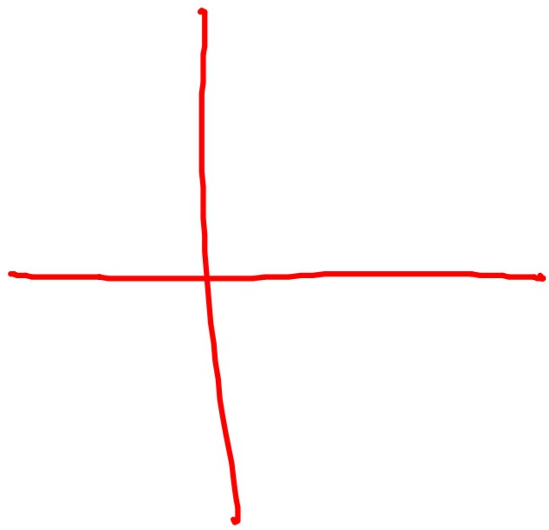
$\lim_{x \to \infty} f(x) = 0$

$\lim_{x \to -\infty} f(x) = \infty$

24

$y = e^x \qquad y = 3e^{2x} - 1$





32) $f(x) = \left(\frac{1}{e}\right)^x$

$(e^{-1})^x$

e^{-x}

p296
#8

11. $\log \sqrt[3]{10}$

$\log 10^{\frac{1}{3}}$

$\frac{1}{3}$

Extra

6. $r^{\frac{1}{3}\log_r V}$

$r^{\log_r V^{1/3}}$

$V^{1/3}$

$\sqrt[3]{V}$

3 $\ln e^{5x+3}$

$5x+3$

$\underline{7}^{\log_{\underline{7}} P}$

P

3.1/3.3 continued

base-base matching

C. $\log_{\frac{1}{3}} 27$

$\log_{\frac{1}{3}} 3^3$

$\log_{\frac{1}{3}} \frac{1}{3^{-3}}$

$\log_{\frac{1}{3}} \left(\frac{1}{3}\right)^{-3}$

-3

* fractional exp:

bottom → root index

top → exp

$x^{\frac{3}{4}}$

$\sqrt[4]{x^3}$ or $\left(\sqrt[4]{x}\right)^3$

D. $\cancel{7}^{\log_{\cancel{7}}(x-10)}$

$x-10$

E. $e^{5\ln y}$

$e^{\ln y^5}$

y^5

E. $\log_3 9 + \log_3 \frac{1}{27}$ $\frac{1}{3^{+3}}$ $1 \cdot 3^{-3}$

$\log_3 3^2 + \log_3 (3)^{-3}$

$2 - 3$

-1

F. $\log_2 8 + \log 10$

$3 + 1$

4

G. $7^{\log_7 (x-10)}$

$=$

$(x-10)$

H. $e^{3\ln(y+1)}$

$e^{\ln(y+1)^3}$

$(y+1)^3$

The 3 Big Guys

1. $\log x + \log y = \log(xy)$
2. $\log x - \log y = \log\left(\frac{x}{y}\right)$
3. $p \log x = \log x^p$

Condense: write as one log. expression

Ex.

A. $\frac{1}{2}\ln y + 2\ln x - 3\ln(y+2)$

1. bring ↑ coeff. to be exp.

$\ln y^{\frac{1}{2}} + \ln x^2 - \ln(y+2)^3$

2. condense

$+ \rightarrow \cdot$

$- \rightarrow \div$

$\ln\left(\frac{y^{\frac{1}{2}}x^2}{(y+2)^3}\right)$

3. clean it up!

$\ln\left(\frac{\sqrt{y}\cdot x^2}{(y+2)^3}\right)$

B. $\frac{3}{4}\log_5(x+2) - \frac{1}{2}\log_5 y + \frac{2}{5}\log_5 x - 4\log_5 m$

$\log_5(x+2)^{3/4} - \log_5 y^{1/2} + \log_5 x^{2/5} - \log_5 m^4$

$\log_5\left(\frac{(x+2)^{3/4}\left(x^{2/5}\right)}{\left(y^{1/2}\right)\left(m^4\right)}\right) \rightarrow \log_5\left(\frac{\left(\sqrt[4]{x+2}\right)^3\left(\sqrt[5]{x^2}\right.}{\left(\sqrt{y}\right)\left(m^4\right)}\right.$

B. $3\log_2(x-1) - \frac{2}{3}\log_2 y + \log_2 x - \frac{5}{4}\log_2(y)$

$$\log_2(x-1)^3 - \log_2 y^{\frac{2}{3}} + \log_2 x - \log_2 y^{\frac{5}{4}}$$

$$\log_2\left(\frac{(x-1)^3\, x}{\sqrt[3]{y^2}\,\sqrt[4]{y^5}}\right)$$

$$\log_2\left(\frac{(x-1)^3\, x}{\sqrt[3]{y^2}\,\sqrt[4]{yyyyy}}\right)$$

$$\log_2\left(\frac{(x-1)^3\, x}{\sqrt[3]{y^2}\; y\sqrt[4]{y}}\right)$$

Expand

A. $\log_3\left(\dfrac{5x^4\sqrt{y-1}}{y^3(z+1)^2}\right)$

$\log_3 5 + \log_3 x^4 + \log_3 \sqrt{y-1} - \log_3 y^3 -$

$\log_3 5 + 4\log_3 x + \frac{1}{2}\log_3(y-1) - 3\log_3 y - 2\log$

Ex Condense.

A. $3\ln(x-1) + \frac{2}{3}\ln y - 4\ln(z+3)$

$\ln(x-1)^3 + \ln y^{\frac{2}{3}} - \ln(z+3)^4$ ① bring coeff. ↑

$\ln\left(\frac{(x-1)^3 y^{\frac{2}{3}}}{(z+3)^4}\right)$

② one log of a frac.

$+ \rightarrow$ num.

$- \rightarrow$ denom.

$\ln\left(\frac{(x-1)^3 \sqrt[3]{y^2}}{(z+3)^4}\right)$

③ clean up!

$\left(\sqrt[3]{y}\right)^2$

Expand

A. $\log_3\left(\frac{5x^4(y-1)^2}{\sqrt[4]{z^3}}\right)$

$\log_3(5x^4(y-1)^2) - \log_3 \sqrt[4]{z^3}$

$\log_3 5 + \log_3 x^4 + \log_3 (y-1)^2 - \log_3 z^{\frac{3}{4}}$

$\boxed{\log_3 5 + 4\log_3 x + 2\log_3(y-1) - \frac{3}{4}\log_3 z}$

What if.....

$\log_3 (5x)^4$

$4\log_3(5x)$

$4\left[\log_3 5 + \log_3 x\right]$

How do you know if an exponential function represents **exponential growth?**

$y=3^x$ $y=e^x$ $y=\left(\frac{5}{4}\right)^x$

How do you know if an exponential function represents **exponential decay?**

$y=\left(\frac{1}{2}\right)^x$ $y=(.75)^x$

$y=4(1.23)^x$

b > 1

0 < b < 1

~ often times exp. math is used in real world scenarios.

$y = ab^x$ → x → time

a → initial value

b → base → rate

$a(1 \pm r)^t$

used for percent increase, percent decrease, appreciation, depreciation

<u>Ex</u> initial pop. of bunnies is 50
rate of probigation 13% per day

a) $y = 50(1 + .13)^t$

b) determine # bunnies in 10 days

$y = 50(1.13)^{10}$

$y = 169.7$ bunnies

How to write the equation of an exponential function given the y-intercept and a point...

a = initial value or y-int

STEPS:

1. Substitute the values of (0, a) and (x, y) into $y = ab^x$.
2. Solve for b.
3. Substitute values of a and b into $y = ab^x$

GUIDED PRACTICE:

7. (0, − 1) and (2, − 9)

x y

$y = ab^x$

$y = -1b^x$

$-9 = -1b^2$

$\sqrt{9} = \sqrt{b^2}$

$b = \pm 3$

$b = 3$

$y = -(3)^x$

ex (0, 6) (−3, 4)

x y

$y = ab^x$

$4 = 6b^{-3}$

$\frac{4}{1} = \frac{6}{b^3}$

$4b^3 = 6$

$b^3 = \frac{3}{2}$

$b = \sqrt[3]{3/2}$

$y = 6\left(\sqrt[3]{\tfrac{3}{2}}\right)^x$