Quiz today:

* 3:30 - 4:45

  in Moore Hall Filene Aud.

* 6:30 - 7:45

  in Kemeny 008

Today: Exponential
and logarithmic
functions.

Correction

Recall:

$$a^n = \underbrace{a \cdot a \cdots a}_{n \text{ times}}$$

$$a^r = \left(\sqrt[n]{a}\right)^m \qquad \text{if} \qquad r = \frac{m}{n}$$

ex

$$2 \cdot 2 \cdot 2 = 2^3$$

$$\sqrt{2} = 2^{1/2}$$

$$\sqrt[3]{2} = 2^{1/3}$$

$$\left(\sqrt[31]{2}\right)^{1001} = 2^{1001/31}$$

Basics:

2^2 means $2 \cdot 2$

2^3 means $2 \cdot 2 \cdot 2$

$$2^2 \cdot 2^3 = \overbrace{(2 \cdot 2)}^{2} \cdot \overbrace{(2 \cdot 2 \cdot 2)}^{3} \qquad 2 + 3 = 5$$

$$= 2^5$$

If a, b, c are positive integers,

$$\boxed{a^b \cdot a^c = a^{b+c}}$$

$$(2^2)^3 = (2 \cdot 2) \cdot (2 \cdot 2) \cdot (2 \cdot 2)$$

$$= 2^6$$

$$\boxed{(a^b)^c = a^{b \cdot c}}$$

we know what

a^x means for

   ①   x   is   a   pos   int

   ②   x   is   a   fraction
                               ↑
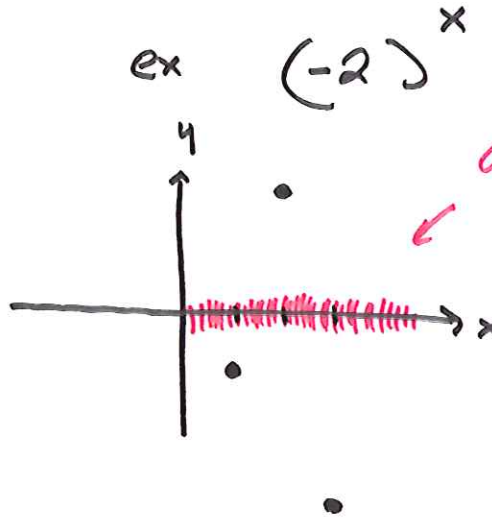   }   w/ pos
                               num & denom

   ③   x   is   any   fraction
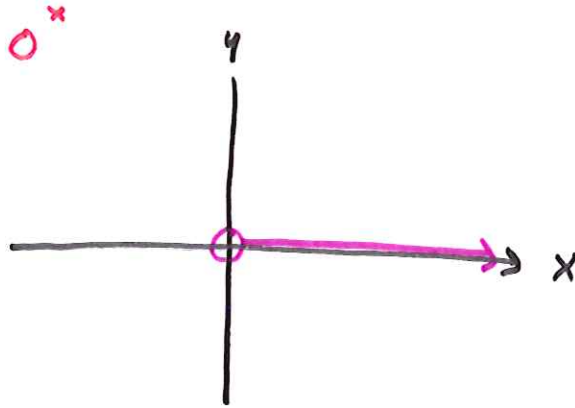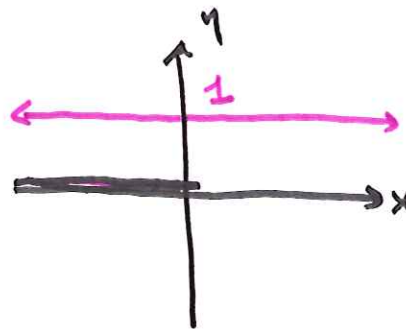
Fill in gaps to get
a^x for all reals

Missing:

← not defined

a < 0   ex $(-2)^x$

x	$(-2)^x$
1	-2
2	4
3	-8
1/2	undef

anywhre
@ $\frac{m}{n}$ if

n is even

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a = 0 0^x

x	0^x
1	0
1/2	0
0	???
-1	undef

a = 1

Ba^x if $a > 1$, $B > 0$
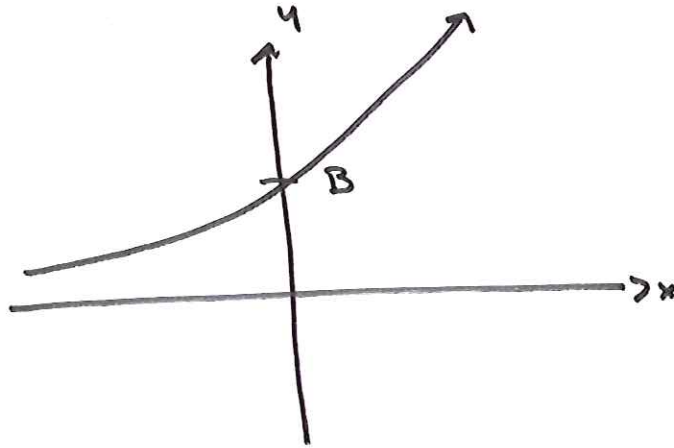
Ba^x if $a > 1$, $B < 0$
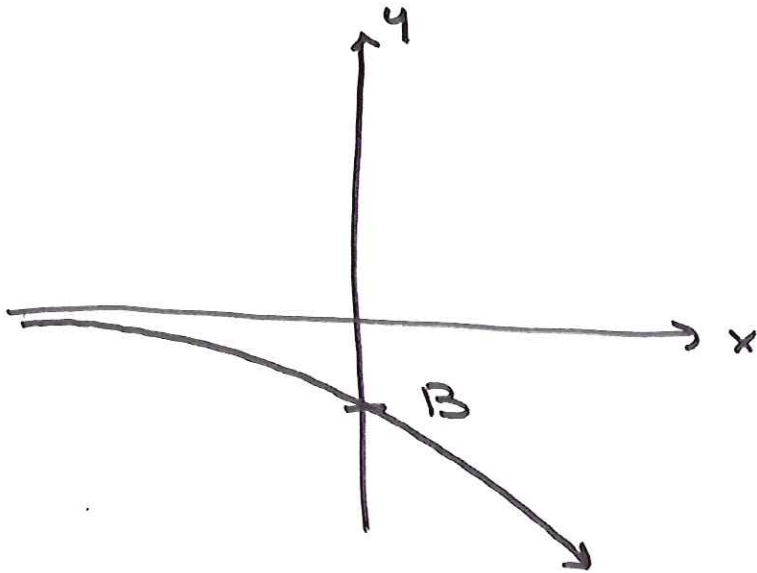
$$f^{-1}(x) \qquad \text{satisfies}$$

$$f(f^{-1}(x)) = x$$

and

$$f^{-1}(f(x)) = x$$

— or —

if $f(x) = y$, then $f^{-1}(y) = x$.

ex

$$\log_2(4) = 2$$

b/c $2^2 = 4$

$$\log_2(8) = 3$$

b/c $2^3 = 8$

$a^0 = 1$ so $\log_a 1 = 0$

$a^1 = a$ so $\log_a a = 1$