6 11/26/2012 - Sec 10.2 Math 1010

18

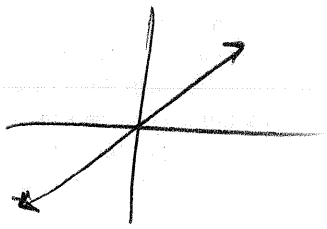
~~23~~

33

#6

A: $f(x) = x$ ← line

One-to-one

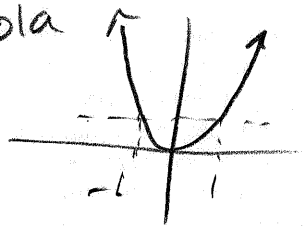


B: $f(x) = x^2$ ← parabola

Not one-to-one

$f(-1) = 1 = f(1)$

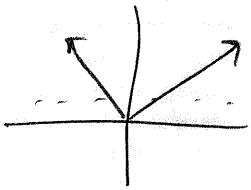
$f(-2) = 4 = f(2)$



C: $f(x) = |x|$ ← V-shape

Not one-to-one

$f(-1) = 1 = f(1)$



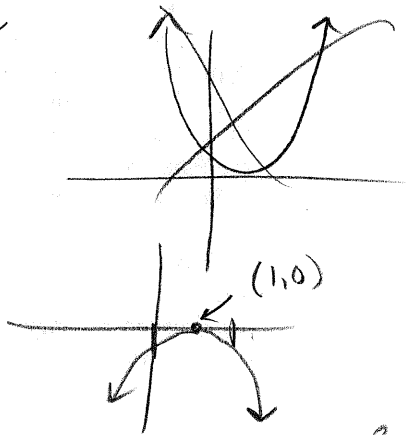
D: $f(x) = -x^2 + 2x - 1$ ←

$-(x^2 - 2x + 1)$

$-(x-1)^2$

Not one-to-one

$f(0) = -1 = f(2)$



$-(0)^2 + 2(0) - 1$

-1

$-(2)^2 + 2(2) - 1$

$-4 + 4 - 1$

-1

#18

$f(x) = 4x^2 - 1$

Not one-to-one

$y = 4x^2 - 1$

$x = 4y^2 - 1$

$+1 \quad +1$

$\frac{x+1}{4} = \frac{4y^2}{4}$

$\pm\sqrt{\frac{x+1}{4}} = \sqrt{y^2}$

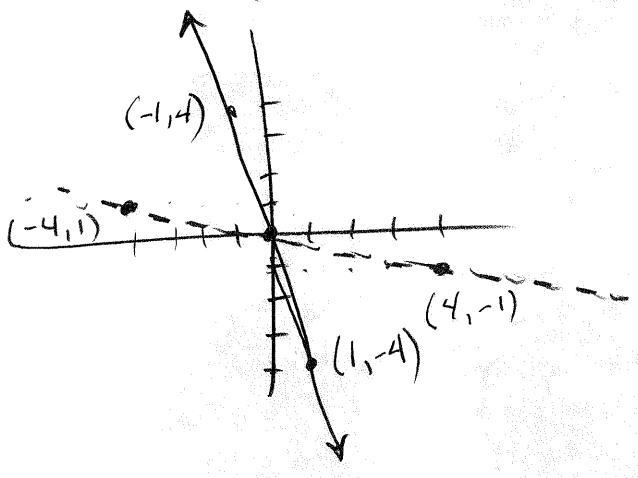
$\pm$ causes failure

Not one-to-one

#33 $g(x) = -4x$

y-int: 0

slope: $-4/1$



Lines: $mx + b$

m: Slope

b: y-int

$g(x) = -4x$

$y = -4x$

$x = -4y$

$-\frac{1}{4}x = y$ ← y-int = 0, Slope = $-1/4$

Sec 10.2 Exponential Functions

Exponential Function

For $a > 0$, $a \neq 1$ and all Real Numbers x

$$f(x) = a^x$$

defines the exponential function with base a

Ex: $f(x) = 2^x$, $f(x) = 10^x$, $f(x) = \left(\frac{3}{2}\right)^x$

$f(x) = \pi^x$

previously $f(x) = x^2$

if $a = 1$

$1^x = 1$ ← Not exponential because it's a constant

if a was Neg ($a < 0$)

$(-2)^x \Rightarrow (-2)^{1/2} = \sqrt{-2}$

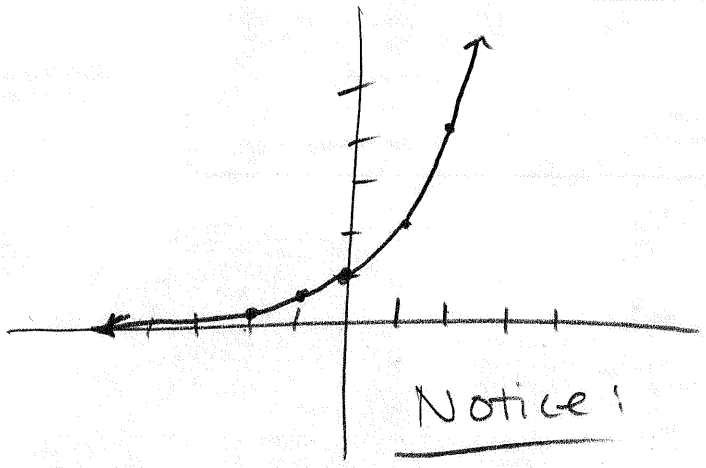
Graphing Exponentials

Case 1: $a > 1$

Ex: $f(x) = 2^x$

x	y
-2	$2^{-2} = \frac{1}{2^2} = \frac{1}{4}$
-1	$2^{-1} = \frac{1}{2^1} = \frac{1}{2}$
0	$2^0 = 1$
1	$2^1 = 2$
2	$2^2 = 4$

(more neg ↑ ↓ bigger; y: smaller closer to 0)



Notice:

HA: $y = 0$

Increasing

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

Range: $(0, \infty)$

y-int: $(0, 1)$

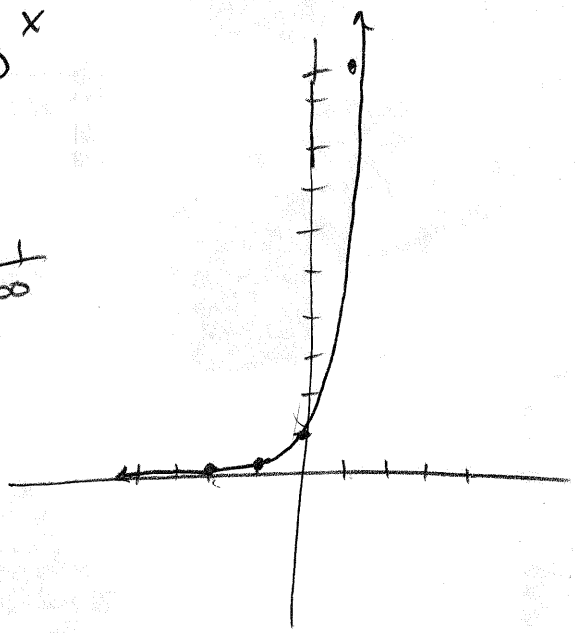
x-int: None

one to one

as base changes, steepness changes

Ex: $f(x) = 10^x$

x	y
-2	$10^{-2} = \frac{1}{10^2} = \frac{1}{100}$
-1	$10^{-1} = \frac{1}{10^1} = \frac{1}{10}$
0	$10^0 = 1$
1	$10^1 = 10$
2	$10^2 = 100$

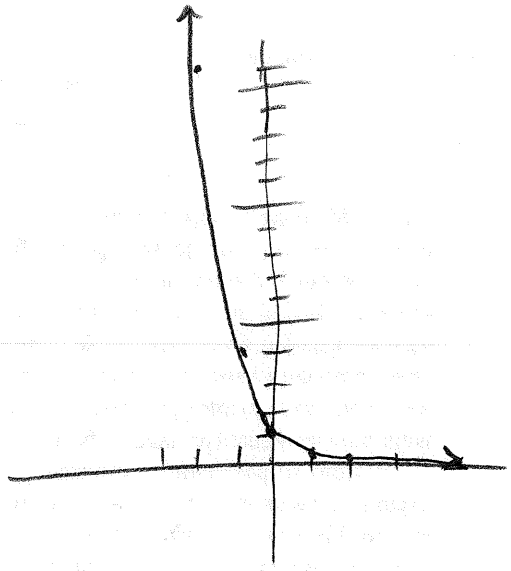


Case 2: $0 < a < 1$

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

x	y
−2	$(1/4)^{-2} = (4/1)^2 = 4^2/1^2 = 16$
−1	$(1/4)^{-1} = (4/1)^1 = 4^1/1^1 = 4$
0	$(1/4)^0 = 1$
1	$(1/4)^1 = 1/4$
2	$(1/4)^2 = 1/16$

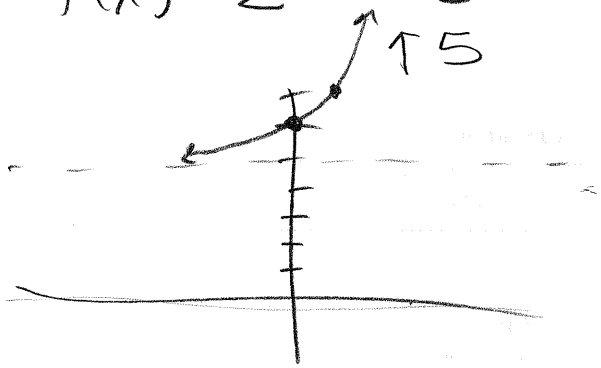
(y: bigger ↑ as x ↓; closer to 0 ↓ as x ↓)



Summary of the Graph $f(x) = a^x$ (parent function)

1. The graph contains the point $(0,1)$ and $(1,a)$
2. The function is one-to-one
3. If $a > 1$ the graph is increasing
   if $0 < a < 1$ the graph is decreasing
4. Horizontal Asymptote at $y = 0$
5. Domain: $(-\infty, \infty)$
   Range: $(0, \infty)$

$f(x) = 2^x + 5$



x	y
-2	$1/4 + 5$
-1	$1/2 + 5$
0	$1 + 5 = 6$
1	$2 + 5 = 7$
2	$4 + 5 = 9$

Exponential Equation: is an Equation that has a variable in the exponent

Ex: $9^x = 27$, $8^x = 16$

We Need to solve these using the following property

If $a^x = a^y$ then $x = y$

Note bases are the same!!!

$9^x = 27$ $\quad (3^2)^x = 3^3$ $\quad 3^{2x} = 3^3 \Rightarrow \frac{2x}{2} = \frac{3}{2}$

$\boxed{x = 3/2}$

How to

1st Rewrite Each side using the same base, if possible

2nd Simplify Expopenents if necessary using the Rules of Exponents (Reference: Pg 269, 309, 439, 484

3rd Apply property by setting Exponents Equal

4th Solved resulting Eq.

5th Check

$8^x = 16$

$(2^3)^x = 2^4$

$2^{3x} = 2^4$

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

$x = 4/3$