BE - Alg. 2 | TUESDAY 3-30-10

Simplify:  USE EXPONENT RULES

(1.) X^5X^3X

(2) $\frac{X^5}{X^3}$

(3) $\frac{X^5}{X^0}$

(4) $\frac{X^3}{X^5}$

(5) X^{-5}

(6) $\frac{1}{X^{-3}}$

(7) $(a^4b^3c^2)^5$

(8) $(X^7)^5$

(9) $(16)^{\frac{3}{4}}$

- Memorize THE 6 EXPONENT rules

plus #7 ⇒ FRACTIONAL EXPONENT RULE

$$a^{\frac{N}{m}} = \sqrt[m]{a^N} \text{ or } \left(\sqrt[m]{a}\right)^N$$

(EX) $16^{\frac{3}{4}} = \sqrt[4]{16^3} \text{ or } \left(\sqrt[4]{16}\right)^3$

$= (2)^3 = \boxed{8}$

Ch. 10-1 Exponential Functions

Exponential function — A function where the independent variable (x) is an exponent.

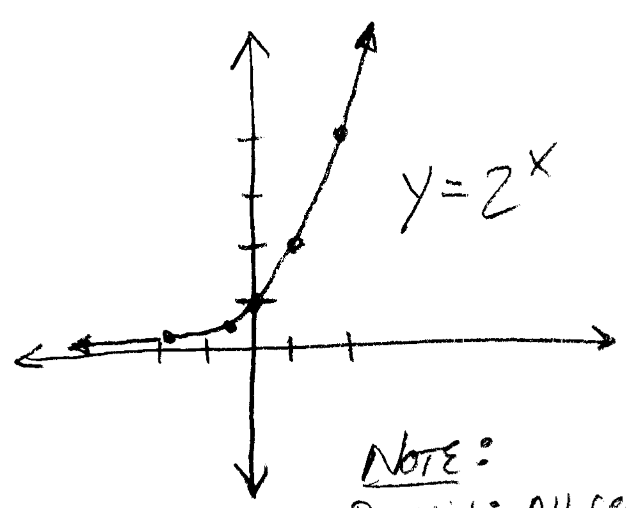
Ex $y = ab^x$

b = base
a = constant, often called the "initial value" since when $x = 0$, $y = ab^0 = a(1)$
$y = a$

Ex 1 PG 523 $y = 2^x$ $\Rightarrow a = 1$, $b = 2$

x	$y = 2^x$
-2	$2^{-2} = \frac{1}{2^2} = \frac{1}{4}$
-1	$2^{-1} = \frac{1}{2}$
0	$2^0 = 1$
1	$2^1 = 2$
2	$2^2 = 4$
$-\infty$	Approaches 0 asymptotically – never crosses 0
$+\infty$	keeps getting bigger, passes to right of any X eventually

Key point: $x = 0$, $2^0 = 1$



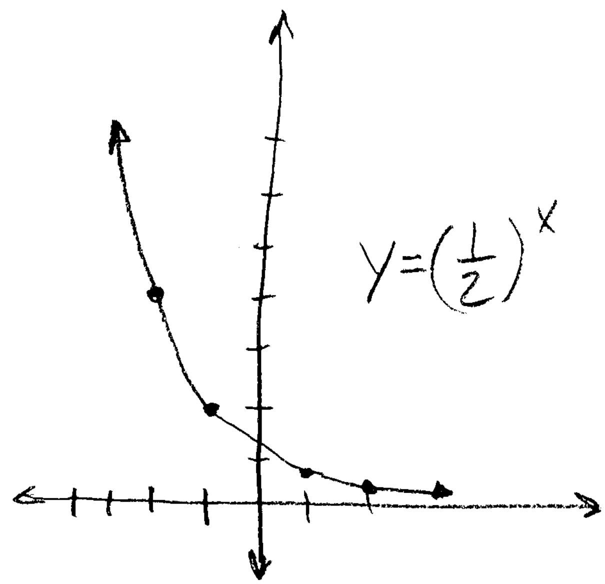
Note:
Domain: All reals
Range: $y > 0$

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

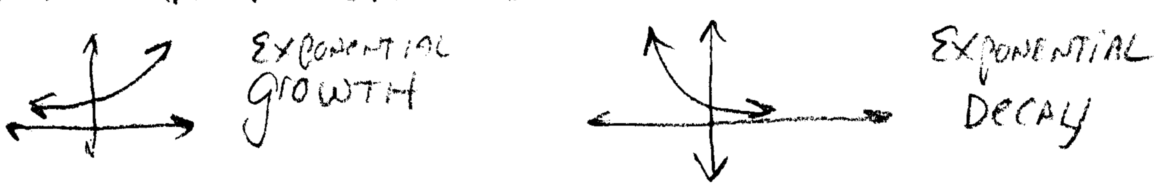
$a = 1$
$b = \frac{1}{2}$

x	$\left(\frac{1}{2}\right)^x$
-2	$\left(\frac{1}{2}\right)^{-2} = \frac{1}{\left(\frac{1}{2}\right)^2} = \frac{1}{\frac{1}{4}} = 4$
-1	$\left(\frac{1}{2}\right)^{-1} = \frac{1}{\left(\frac{1}{2}\right)^1} = 2$
0	$\left(\frac{1}{2}\right)^0 = 1$
1	$\left(\frac{1}{2}\right)^1 = \frac{1}{2}$
2	$\left(\frac{1}{2}\right)^2 = \frac{1}{4}$
$+\infty$	Approaches 0 asymptotically
$-\infty$	Keep ↑, NOT ASYMPTOTE

Key point ⇓ y-intercept ⇓ "initial" value



Exponential Functions:



Base > 1 $\qquad$ 0 < Base < 1

- Base ≠ 1, why? $y = 1^x = 1$ NOT EXPONENTIAL, just horizontal line
- Base ≠ Negative, why? $(-b)^x$ even ⇒ positive
  $(-b)^x$ odd ⇒ Negative
  Graph is "crazy" ↑ ↓

Domain of $y = 2^x$ is "All reals"

$\therefore$ $y = 2^{\sqrt{5}}$ must exist $\Rightarrow$ Need calculator to approximate

$y = 2^{\sqrt{5}} \approx 2^{(2.2361)} \approx 4.7112$

Note: $2^2 = 4$ $\quad 2^3 = 8$

$\therefore$ $2^{\sqrt{5}} \cong 4.7$ is reasonable

Do not mix up $y = x^2$ with $y = 2^x$

Quadratic function (parabola) $\qquad$ Exponential function

Domain: All reals $\qquad$ Domain: All reals

Range: All reals $\qquad$ Range: $y > 0$

EX2 Identify: Exponential Growth or Decay?

(A.) $y = \left(\frac{1}{5}\right)^x \qquad a = 1 \quad b = \frac{1}{5}$

(b) $y = 3(4)^x \qquad a = 3 \quad b = 4$

(c.) $y = 7(1.2)^x \qquad a = 7 \quad b = 1.2$

Pg. 526 ⇒

Property of Equality for Exponential Functions

$$\boxed{\begin{array}{l} \text{for } b > 0 \text{ except } b \neq 1 \\ \text{then } b^x = b^y \text{ iff } x = y \end{array}}$$

Ex $2^x = 2^8$ $x = 8$ Ck: $2^8 = 2^8$

Ex $3^{x-2} = 27$

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

$\therefore x - 2 = 3$

$\boxed{x = 5}$

Ck $3^{(\ )-2} \stackrel{?}{=} 27$

$3^{(5)-2} \stackrel{?}{=} 27$ ✓

Ex 5 Pg 526

A $3^{2N+1} = 81$

$3^{2N+1} = 3^4$

$\therefore 2N + 1 = 4$

$\boxed{N = \frac{3}{2}}$

Ck $3^{2(\frac{3}{2})+1} \stackrel{?}{=} 81$

$3^4 \stackrel{?}{=} 81$ ✓

b $4^{2x} = 8^{x-1}$

$(2^2)^{2x} = (2^3)^{x-1}$ $\therefore 2^{4x} = 2^{3x-3}$

$4x = 3x - 3$

$\boxed{x = -3}$

Ck $4^{2(-3)} \stackrel{?}{=} 8^{(-3)-1}$

$4^{-6} = 8^{-4}$

$\frac{1}{4^6} = \frac{1}{8^4}$

$4^6 = 4096$

$8^4 = 4096$ ✓

Homework:

Pg 527-528

2-10, 16, 18.