BE - Alg. 2

Monday 4-9-12

Simplify: USE EXPONENT RULES

1. $x^5 x^3 x$

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

8. $(x^7)^5$

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

- Memorize the 6 exponent rules plus #7 ⇒

FRACTIONAL EXPONENT RULE

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

Ex $16^{\frac{3}{4}} = \sqrt[4]{16^3}$ or $(\sqrt[4]{16})^3$

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

Ch. 10-1 Exponential Functions

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

(Ex) $y = a\,b^x$

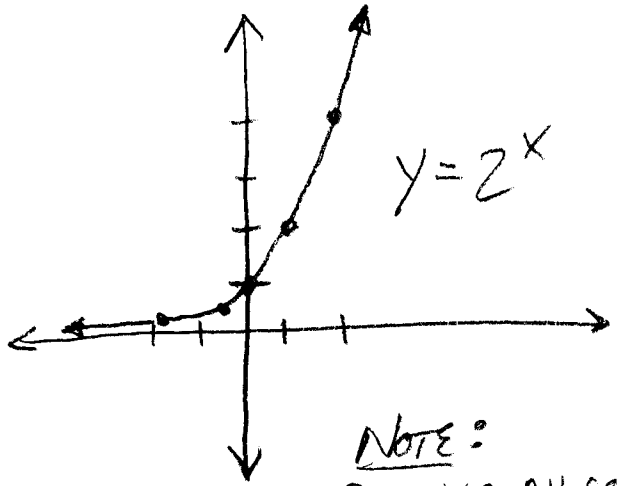
b = base

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

$y = a$

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

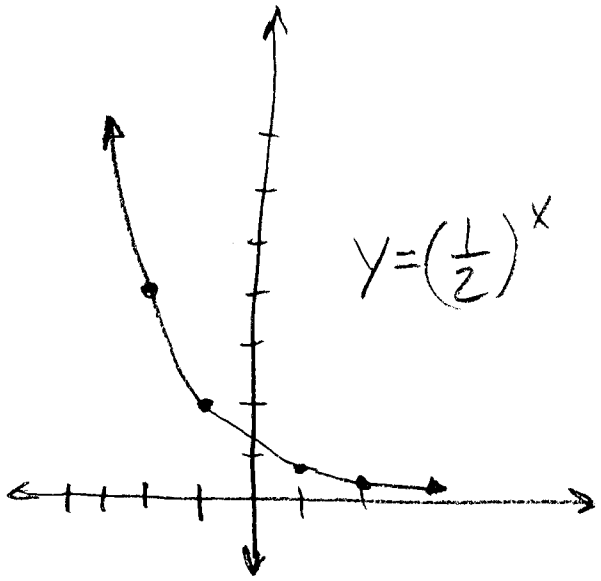
x	$y = 2^x$
-2	$2^{-2} = \frac{1}{2^2} = \frac{1}{4}$
-1	$2^{-1} = \frac{1}{2}$
Key point: 0	$2^0 = 1$
1	$2^1 = 2$
2	$2^2 = 4$
$-\infty$	Approaches 0 asymptotically - never crosses 0
$+\infty$	keeps getting bigger, passes to right of any x eventually



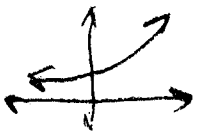
Note:
Domain: All reals
Range: $y > 0$

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

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	$\left(\frac{1}{2}\right)^{-1} = \frac{1}{\left(\frac{1}{2}\right)^1} = 2$
Key point → Y-intercept → "initial" value 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

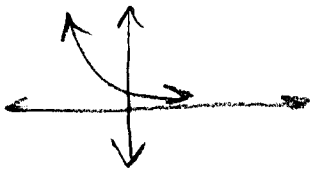


Exponential Functions:



Exponential growth

Base > 1



Exponential decay

$0 <$ Base < 1

- Base $\neq 1$, why? $y = 1^x = 1$ NOT EXPONENTIAL, JUST HORIZONTAL LINE
- Base $\neq$ Negative, why?

$(-b)^x$ even $\Rightarrow$ positive

$(-b)^x$ odd $\Rightarrow$ 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: $2^2 = 4$ $2^3 = 8$

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

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

$y = x^2$: Quadratic function (parabola)
DOMAIN: All reals
RANGE: All reals

$y = 2^x$: EXPONENTIAL function
DOMAIN: All reals
RANGE: $y > 0$

Ex 2 Identify: Exponential Growth or Decay?

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

(B.) $y = 3(4)^x$ $a = 3$ $b = 4$

(C.) $y = 7(1.2)^x$ $a = 7$ $b = 1.2$

Pg. 526 ⇒

Property of Equality for Exponential Functions

> for $b > 0$ except $b \neq 1$
> then $b^x = b^y$ iff $x = y$

(Ex) $2^x = 2^3$ $\quad x = 8$ $\quad$ CK: $2^3 = 2^3$

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

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

$\therefore x - 2 = 3$

$\boxed{x = 5}$

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

$3^{(5)-2} \stackrel{?}{=} 27$ ✓

Ex 5 Pg 526 (A) $3^{2N+1} = 81$

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

$\therefore 2N + 1 = 4$

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

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

$3^4 \stackrel{?}{=} 81$ ✓

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

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

$4x = 3x - 3$

$\boxed{x = -3}$

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

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

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

$4^6 = 4096$

$8^4 = 4096$ ✓

Homework:

Pg 527-528

2-10, 16, 18.