

BE - Alg. 2 | TUESDAY 3-29-11

① List the 7 exponent rules.

② $X^{4N} \cdot X^{2N} = ?$

③ $(X^{-2})^{4N+1} = ?$

④ $27^{\frac{2}{3}} = ?$

⑤ DEFINE AN EXPONENTIAL FUNCTION

• Homework review

Alg. 2 Homework Review: Pg 527-528
#2-10, 16, 18.

② ① $y = 3x^2$ QUADRATIC

③ $y = 4(3)^x$ EXPONENTIAL → growth

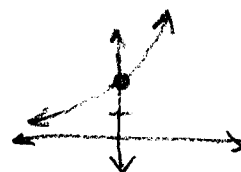
④ $y = 2x + 4$ LINEAR

⑤ $y = 4(0.2)^x + 1$ EXPONENTIAL → decay
↑
vertical shift

③ ② $y = 5^x$



④ ③ $y = 2(5)^x$

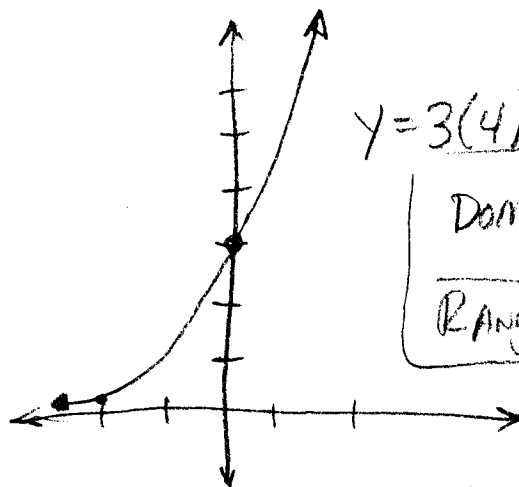


⑤ ④ $y = (\frac{1}{5})^x$



⑥ $y = 3(4)^x$

X	Y
-2	$3(4)^{-2} = 3(\frac{1}{16}) = \frac{3}{16}$
-1	$3(4)^{-1} = \frac{3}{4}$
0	3
1	12
2	48



$y = 3(4)^x$

Domain: $\{\text{All Reals}\}$

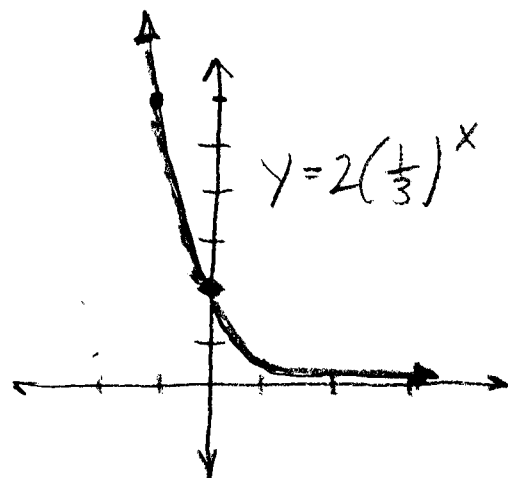
Range: $\{y | y > 0\}$

$$\textcircled{7} \quad y = 2\left(\frac{1}{3}\right)^x$$

Domain: {All Reals}

Range: $\{y \mid y > 0\}$

x	y
-2	$2\left(\frac{1}{3}\right)^{-2} = 2\left(\frac{1}{\frac{1}{9}}\right) = 18$
-1	$2\left(\frac{1}{3}\right)^{-1} = 2\left(\frac{1}{\frac{1}{3}}\right) = 6$
0	2
1	$\frac{2}{3}$
2	$2\left(\frac{1}{3}\right)^2 = 2\left(\frac{1}{9}\right) = \frac{2}{9}$



$$\textcircled{8} \quad y = 2(7)^x \quad \boxed{\text{GROWTH}} \quad \textcircled{9} \quad y = (0.5)^x \quad \boxed{\text{decay}}$$

$$\textcircled{10} \quad y = 0.3(5)^x \quad \boxed{\text{GROWTH}}$$

$$\textcircled{16} \quad 2^{N+4} = \frac{1}{32}$$

$$2^{N+4} = 2^{-5}$$

$$\therefore N+4 = -5$$

$$\boxed{N = -9}$$

$$\text{CK} \quad 2^{(-9)+4} \stackrel{?}{=} \frac{1}{32}$$

$$2^{-5} = \frac{1}{32} \quad \checkmark$$

$$\textcircled{18} \quad 9^{2y-1} = 27^2$$

$$(3^2)^{2y-1} = (3^3)^2$$

$$3^{4y-2} = 3^{6y}$$

$$\therefore 4y-2 = 6y$$

$$\boxed{y = 2}$$

$$\text{CK: } 9^{2(2)-1} \stackrel{?}{=} 27^2$$

$$9^3 \stackrel{?}{=} 27^2 \quad \checkmark \checkmark$$

$$\begin{array}{r} 27 \\ \times 27 \\ \hline 189 \\ 54 \\ \hline 729 \end{array}$$

$$\begin{array}{r} 81 \\ \times 9 \\ \hline 729 \end{array}$$

A more general way to write exponential functions:

$$y = I(1 \pm r)^x$$

r = AMOUNT OF CHANGE
per x as a
decimal

$+r$ = growth

$-r$ = decay

x = Number of changes

I = initial value,
when $x = 0$

$$y = I$$

$A_0 = I = \text{read}$
"A NAUGHT"

OFTEN
WRITTEN

$$A = A_0(1 \pm r)^x$$

(EX) Population increasing 100% per year.
Now at 10,000, find P in 3 years

$$P = P_0(1 + g)^t$$

$$P_0 = 10000$$

$$t = \text{years}$$

$$g = \text{growth, } 100\% = 1.0$$

$$P = 10000(1 + 1.0)^3$$

$$P = 10000(2)^3 = 10000(8) = 80,000$$

$$P = 80,000 \text{ After 3 years}$$

Radioactive decay

20 grams of a radioactive material decays with a half-life of 4 days. How much is left after 30 days?

$$A = A_0 (1 - r)^h$$

$h = \text{number of half-lives}$
 $r = 0.5$
 $A_0 = 20$

$$A = 20 \left(\frac{1}{2}\right)^h$$

$h = \frac{30}{4} = \frac{15}{2} = 7.5$

$$A = 20 (.5)^{7.5}$$

$$A = 20 (.0055) \therefore A \approx .11 \text{ grams}$$

Interest Rate — has own vocabulary
(Compound Interest)

$$A = P \left(1 + \frac{r}{N}\right)^{Nt}$$

Note:

$q = \text{quarterly} \Rightarrow 4 \frac{\text{times}}{\text{year}}$

$d = \text{daily} \Rightarrow 365 \frac{\text{times}}{\text{year}}$

$r = \text{Always ANNUAL rate} \Rightarrow \text{per year}$

$N = \text{how many times a year you pay interest}$

"compounding period"

$Nt = \text{Number of times you pay interest per year} = \text{number of changes!}$

⑥ You invest 25,000 At 5% interest compounded monthly. Worth in 4 years?

$$A = P \left(1 + \frac{r}{n} \right)^{nt} \quad \begin{array}{l} r = 5\% = .05 \text{ per year} \\ n = 12 \text{ (12 months per year)} \end{array}$$

$$A = 25000 \left(1 + \frac{.05}{12} \right)^{12(4)}$$

$\uparrow$ rate per month $\uparrow$ number of months
 (change per $\times$) (number of $\times$'s)

$$A = 25000 (1.004167)^{48}$$

$$A = 25000 (1.2209) = \boxed{\$30,523 \text{ AFTER 4 years}}$$

NOTE: $5\% \text{ of } 25000 = \frac{1250}{\times 4}$

$$\underline{5000}$$

AN EXTRA
~~5~~523 WAS
 GAINED BY PAYING
 "INTEREST ON INTEREST"
 $\Rightarrow$ Compounding

6

Vertical : Horizontal Shifts
(Y $\updownarrow$) (X $\leftrightarrow$)

Ex) $y = 2^x$

$y = 2^{x-1}$

HORIZONTAL SHIFT
1 unit $\rightarrow$

Ex) $y = 2^x - 1$

Vertical SHIFT
1 unit $\downarrow$

Appreciate $\Rightarrow \uparrow$ in value $\Rightarrow A = P(1 + \frac{r}{n})^{nt}$ grow
depreciate $\Rightarrow \downarrow$ in value $\Rightarrow A = P(1 - \frac{r}{n})^{nt}$ decay

Homework: ① Pg 849 Lesson 10-1 # 3-8
13, 14, 16
21, 24

② Pg 851 Lesson 10-6 # 1 $\rightarrow$ 3