BE - Alg. 2 | TUESDAY | 4-10-12

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.

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(2)
(A) $y = 3x^2$ **QUADRATIC**

(b) $y = 4(3)^x$ **EXPONENTIAL** → growth

(c) $y = 2x + 4$ **linear**

(d) $y = 4(0.2)^x + 1$ **EXPONENTIAL** → decay

↑ vertical shift

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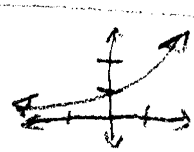
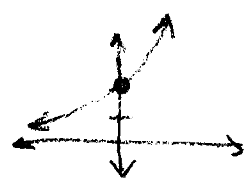
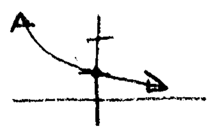
(3) **(c)** $y = 5^x$



(4) **(a)** $y = 2(5)^x$



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



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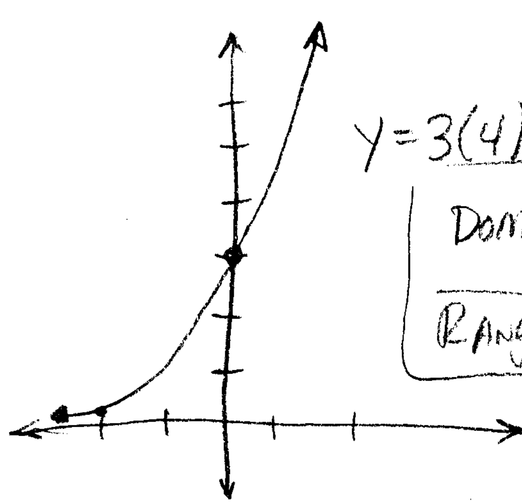
(6) $y = 3(4)^x$

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



$Y = 3(4)^x$

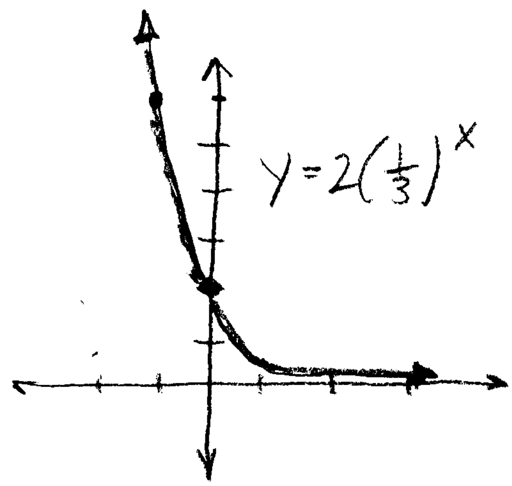
Domain: {All Reals}

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

⑦ $y = 2\left(\frac{1}{3}\right)^x$

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



⑧ $y = 2(7)^x$ GROWTH ⑨ $y = (0.5)^x$ decay

⑩ $y = 0.3(5)^x$ GROWTH

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⑯ $2^{N+4} = \frac{1}{32}$

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

$\therefore N + 4 = -5$

$N = -9$

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

$2^{-5} = \frac{1}{32}$ ✓

⑱ $9^{2y-1} = 27^y$

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

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

$\therefore 4y - 2 = 3y$

$y = 2$

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

$9^3 \stackrel{?}{=} 27^2$ ✓✓

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

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

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 $x = 0$
$y = I$

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

$A_0 = I$ = read "A naught"

(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 = years
g = growth, 100% = 1.0

$$P = 10000(1 + 1.00)^3$$

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

P = 80,000 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 = number of half-lives
$r = 0.5$
$A_0 = 20$

$$A = 20\left(\frac{1}{2}\right)^h \qquad h = \frac{30}{4} = \frac{15}{2} = 7.5$$

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

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

Interest Rate – has own vocabulary
(Compound Interest)

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

r = Always annual rate ⇒ per year

N = how many times a year you pay interest "compounding period"

Nt = Number of times you pay interest per year = Number of changes!

Note:

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

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

(EX) You invest 25,000 at 5% interest compounded monthly. Worth in 4 years?

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

$r = 5\% = .05$ per year

$n = 12$ (12 months per year)

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

rate per month (Change per x) — number of months (Number of x's)

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

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

NOTE: 5% of 25000 = $1250

$$\begin{array}{r} 1250 \\ \times 4 \\ \hline 5000 \end{array}$$

An extra \$523 was gained by paying "interest on interest" ⇒ Compounding

Vertical & Horizontal Shifts
(Y ↕)   (X ↔)

(Ex) $y = 2^x$

$y = 2^{x-1}$ Horizontal shift 1 unit →

(Ex) $y = 2^x - 1$ Vertical shift 1 unit ↓

Appreciate ⇒ ↑ in value ⇒ $A = P(1+\frac{r}{n})^{nt}$ grow

depreciate ⇒ ↓ in value ⇒ $A = P(1-\frac{r}{n})^{nt}$ decay

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

(2) Pg 851 Lesson 10-6 # 1→3