Date: ______________________

Today's Learning Goal(s):

By the end of the class, I will be able to:

a) describe the characteristics of the graphs and equations of exponential functions.

Last day's work:

pp. 235-237 #(1 – 2)ace, 3, (4 – 9)ace [14]

Review p. 239

4.5 Exploring Properties of Exponential Functions

Date: Apr. 10/17

p. 240 Invesgate – students complete A – E individually (or in pairs).

A. $g(x) = x$

x	y
-3	-3
-2	-2
-1	-1
0	0
1	1
2	2
3	3
4	4
5	5

$-2-(-3) = 1$

$-1-(-2) = 1$

$h(x) = x^2$

x	y
-3	9
-2	4
-1	1
0	0
1	1
2	4
3	9
4	16
5	25

1st Diff.

$4-9 = -5$

$1-4 = -3$

$0-1 = -1$

2nd Diff.

$-3-(-5) = 2$

$k(x) = 2^x$

x	y
-3	1/8
-2	¼
-1	½
0	1
1	2
2	4
3	8
4	16
5	32

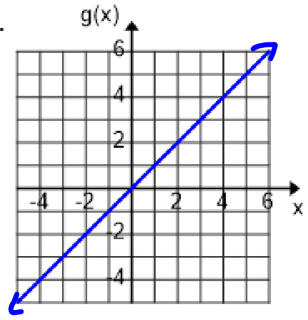
$2^{-3} = \frac{1}{2^3} = \frac{1}{8}$

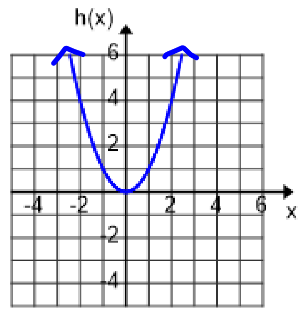
B. $g(x)$ → first differences are equal

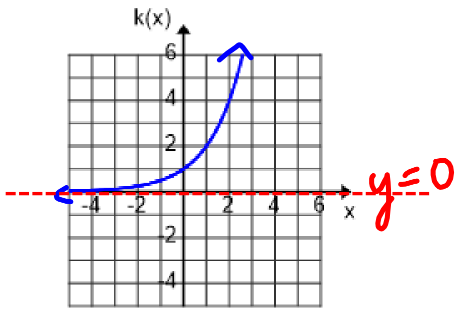
$h(x)$ → second differences are equal

$k(x)$ → ratio of successive y-values are equal

C.







D.

$D = \{x \in \mathbb{R}\}$
$R = \{y \in \mathbb{R}\}$

$D = \{x \in \mathbb{R}\}$
$R = \{y \in \mathbb{R} \mid y \geq 0\}$

$D = \{x \in \mathbb{R}\}$
$R = \{y \in \mathbb{R} \mid y > 0\}$

E. $g(x)$ → as independent variable (x) increases,
the dependent variable (y) also increases at a consistent rate

$h(x)$ → as independent variable (x) increases,
the dependent variable (y) decreases until $x = 0$ and then increases

$k(x)$ → as independent variable (x) increases,
the dependent variable(y) also increases, slowly at first and then quickly.

1ST Diff

2nd Diff

$k(x) = 2^x$

x	y
-3	1/8
-2	¼
-1	½
0	1
1	2
2	4
3	8
4	16
5	32

1st Diff: $\frac{1}{8}$, $\frac{1}{4}$, $\frac{1}{2}$, 1, 2, 4, 8, 16

2nd Diff: $\frac{1}{4}-\frac{1}{8}=\frac{1}{8}$, $\frac{1}{4}$, $\frac{1}{2}$, 1, 2, 4, 8

$k(x) = 2^x$

x	y
-3	1/8
-2	¼
-1	½
0	1
1	2
2	4
3	8
4	16
5	32

y ratios

$\frac{1}{4} \div \frac{1}{8} = 2$

$\frac{1}{2} \div \frac{1}{4} = 2$

$\frac{1}{4} - \frac{1}{8}$
$= \frac{2}{8} - \frac{1}{8}$
$= \frac{1}{8}$

$\frac{1}{2} - \frac{1}{4}$
$= \frac{2}{4} - \frac{1}{4}$
$= \frac{1}{4}$

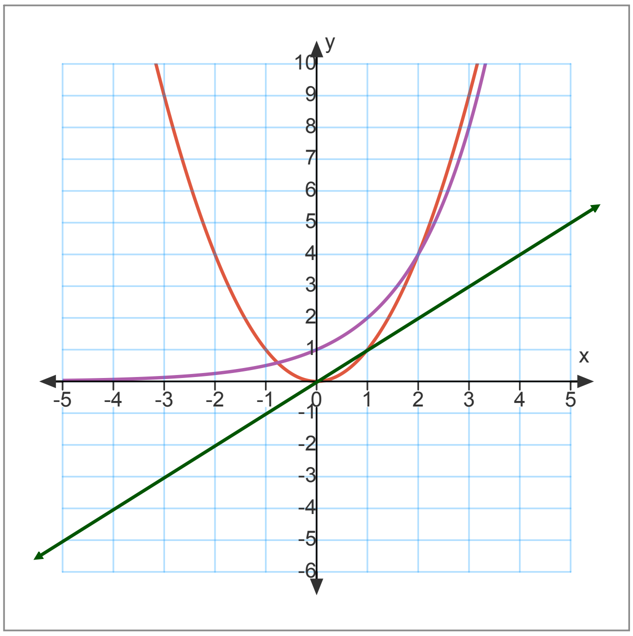
$1 - \frac{1}{2}$
$= \frac{2}{2} - \frac{1}{2}$
$= \frac{1}{2}$

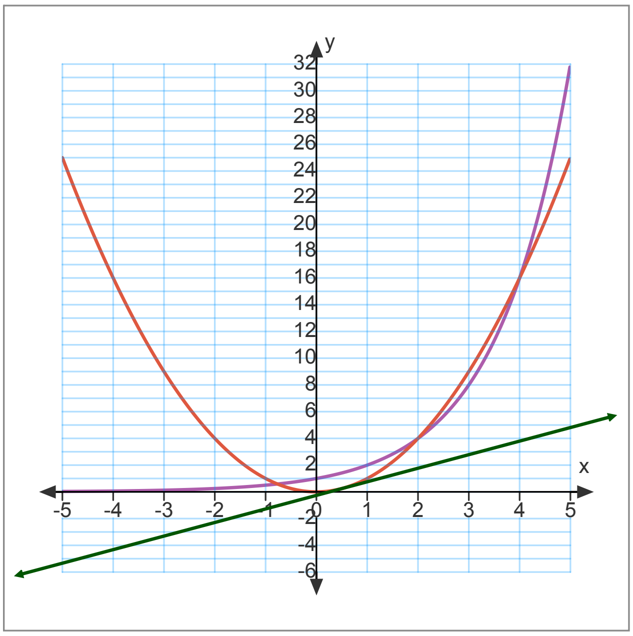
$\frac{1}{4} \div \frac{1}{8}$
$= \frac{1}{\cancel{4}_1} \times \frac{\cancel{8}\,2}{1}$
$= 2$

$\frac{1}{2} \div \frac{1}{4}$
$= \frac{1}{\cancel{2}_1} \times \frac{\cancel{4}\,2}{1}$
$= 2$

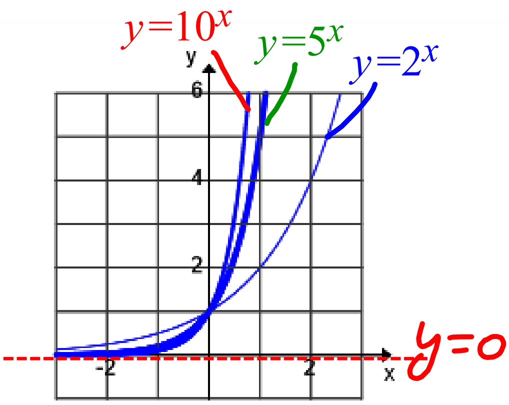
$y = x$ $y = x^2$ $y = x^2$ $y = 2^x$

$y = 2^x$





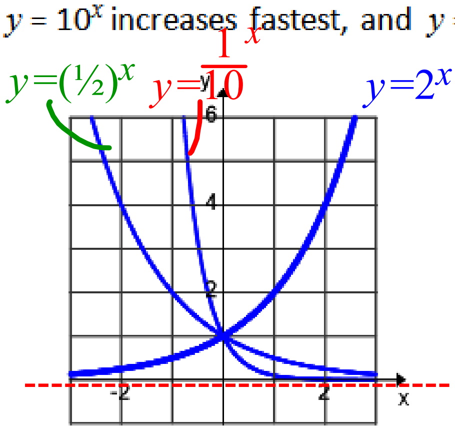
F.



G. For all 3 functions, D = {$x \in \mathbb{R}$} and R = {$y \in \mathbb{R} \mid y > 0$}.
The y-intercept = 1, there are no x-intercepts,
and there is a Horizontal Axis of Symmetry [HASM] at $y = 0$ (x-axis).

H. $y = 10^x$ increases fastest, and $y = 2^x$ has the slowest rate of increase.

I.



J. All properties remain the same as G.

K. As the values of x increase the graphs with fractional bases decrease (decay).

Summary: Properties of $y = b^x$

- $b > 0$
- y-int = 1
- HASM: $y = 0$ (x-axis) [Horizontal Axis of Symmetry]
- D = $\{x \in \mathbb{R}\}$
- R = $\{y \in \mathbb{R} \mid y > 0\}$
- Increasing when $b > 1$ (growth)
- The greater the value of b, the faster the growth
- Decreasing when $0 < b < 1$ (decay)
- Equal ratios of successive y-values

For tomorrow, think about the general form of $y = a(b^x) + c$
and how the values of a and c relate to the graphs we drew today.

Are there any Homework Questions you would like to see on the board?

Last day's work:
pp. 235-237 #(1 – 2)ace, 3, (4 – 9)ace [14]
Review p. 239

6e
8ac
9ac

Today's Homework Practice includes:

pp. 240-241 A - P
p. 243 #1, 2

p. 236

6. Simplify. Express answers with positive exponents.

e) $\left(\frac{(32x^5)^{-2}}{(x^{-1})^{10}}\right)^{0.2}$

$$= \frac{(32x^5)^{-0.4}}{(x^{-1})^2}$$

$$= \frac{(32x^5)^{-\frac{4}{10}}}{x^{-2}}$$

$$= \frac{x^2}{(32x^5)^{\frac{2}{5}}}$$

$$= \frac{x^2}{(\sqrt[5]{32})^2 x^2}$$

$$= \frac{1}{(2)^2}$$

$$= \frac{1}{4}$$

p. 237

8. Evaluate. Express answers in rational form with positive exponents.

a) $(\sqrt{10\,000x})^{\frac{3}{2}}$ for $x = 16$

$= ((10\,000x)^{\frac{1}{2}})^{\frac{3}{2}}$

$= (10000x)^{\frac{3}{4}}$

$= 10000^{\frac{3}{4}} x^{\frac{3}{4}}$

$= (\sqrt[4]{10000})^3 x^{\frac{3}{4}}$

$= 10^3 x^{\frac{3}{4}}$

$= 1000 x^{\frac{3}{4}}$

$= 1000(16)^{\frac{3}{4}}$

$= 1000(\sqrt[4]{16})^3$

$= 1000(2)^3$

$= 1000(8)$

$= 8000$

c) $(-2a^2b)^{-3}\sqrt{25a^4b^6}$ for $a = 1$, $b = 2$

$= (-2)^{-3}(a^2)^{-3}(b)^{-3}(25)^{\frac{1}{2}}(a^4)^{\frac{1}{2}}(b^6)^{\frac{1}{2}}$

$= \frac{1}{(-2)^3} a^{-6} b^{-3} \cdot 5a^2 b^3$

$= \frac{1}{-8} \cdot 5a^{-6+2} b^{-3+3}$

$= \frac{-5}{8} a^{-4} b^0$

$= \frac{-5}{8a^4}$

$= \frac{-5}{8(1)^4}$

$= \frac{-5}{8}$

p. 237

9. Simplify. Express answers in rational form with positive exponents.

a) $(36m^4n^6)^{0.5}(81m^{12}n^8)^{0.25}$

$= 36^{\frac{1}{2}}m^2n^3 \cdot 81^{\frac{1}{4}}m^3n^2$

$= \sqrt{36}\,\sqrt[4]{81}\,m^{2+3}n^{3+2}$

$= 6 \cdot 3\,m^5n^5$

$= 18m^5n^5$

c) $\left(\frac{\sqrt{64a^{12}}}{(a^{1.5})^{-6}}\right)^{\frac{2}{3}}$

$= \left(\frac{(64a^{12})^{\frac{1}{2}}}{(a^{\frac{3}{2}})^{-6}}\right)^{\frac{2}{3}}$

$= \frac{(64a^{12})^{\frac{1}{3}}}{(a^{-\cancel{9}\,3})^{\cancel{\frac{2}{3}}}}$

$= \frac{\sqrt[3]{64}\,(a^{\cancel{12}\,4})^{\cancel{\frac{1}{3}}}}{a^{-6}}$

$= 4a^{4-(-6)}$

$= 4a^{10}$