Today's Learning Goal(s):

Date: ____________________

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

8a c
5e
9c

p. 236

5. Simplify. Express answers with positive exponents.

e) $\frac{p^{-5}(r^3)^2}{(p^2r)^2(p^{-1})^2}$

$= \frac{p^{-5}r^6}{p^4r^2p^{-2}}$

$= p^{-5-4-(-2)}r^{6-2}$

$= p^{-7}r^4$

$= \frac{r^4}{p^7}$

p. 236

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

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

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

$= (10\,000x)^{\frac{3}{4}}$

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

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

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

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

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

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

$= 1000(2)^3$

$= 1000(8)$

$= 8000$

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

$= (-2)^{-3}a^{-6}b^{-3}(5)a^2b^3$

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

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

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

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

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

p. 236

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

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

$= \left(\frac{8(a^{12})^{\frac{1}{2}}}{a^{1.5\times(-6)}}\right)^{\frac{2}{3}}$

$= \left(\frac{8a^6}{a^{-9}}\right)^{\frac{2}{3}}$

$= (8a^{6-(-9)})^{\frac{2}{3}}$

$= (8a^{15})^{\frac{2}{3}}$

$= (\sqrt[3]{8})^2(a^{\cancel{15}^{5}})^{\frac{2}{\cancel{3}_{1}}}$

$= (2)^2a^{5\times2}$

$= 4a^{10}$

4.5 Exploring Properties of Exponential Functions

Date: Apr. 9/18

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

A. $g(x) = x$

FD

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

$-2-(-3) = 1$
$-1-(-2) = 1$
$0-(-1) = 1$
$1-0 = 1$
$2-1 = 1$
$3-2 = 1$
$4-3 = 1$
$5-4 = 1$

$h(x) = x^2$

FD SD

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

$4-9 = -5$
$1-4 = -3$
$0-1 = -1$
$1-0 = 1$
$4-1 = 3$
$9-4 = 5$
$16-9 = 7$
$25-16 = 9$

$-3-(-5) = 2$
$-1-(-3) = 2$
$1-(-1) = 2$
$3-1 = 2$
$5-3 = 2$
$7-5 = 2$
$9-7 = 2$

$k(x) = 2^x$

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

$\frac{1}{4} \div \frac{1}{8}$
$= \frac{1}{4} \times \frac{8}{1} = 2$
$\frac{1}{2} \div \frac{1}{4} = \frac{1}{2} \times \frac{4}{1} = 2$
$2 \div 1 = 2$
$4 \div 2 = 2$
$8 \div 4 = 2$
$16 \div 8 = 2$
$32 \div 16 = 2$

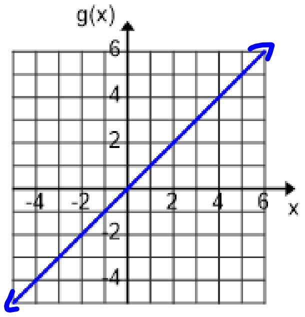
B. g(x) → first differences are equal ∴ linear

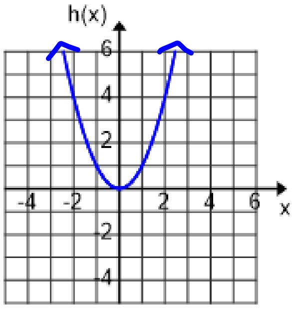
h(x) → second differences are equal ∴ quadratic

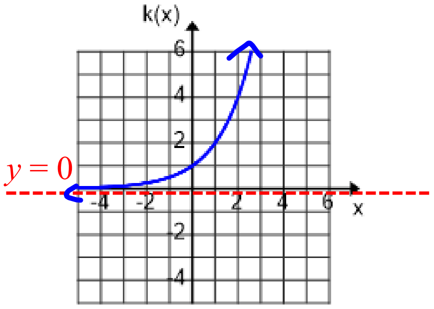
k(x) → ratio of successive y-values are equal ∴ exponential

use first differences to eliminate translation?

C.







D.

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

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

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

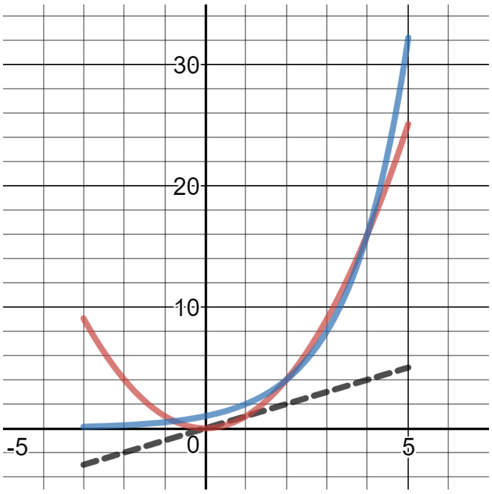
E. g(x) → as independent variable (x) increases,
the dependent variable (y) also increases at a consistent rate

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

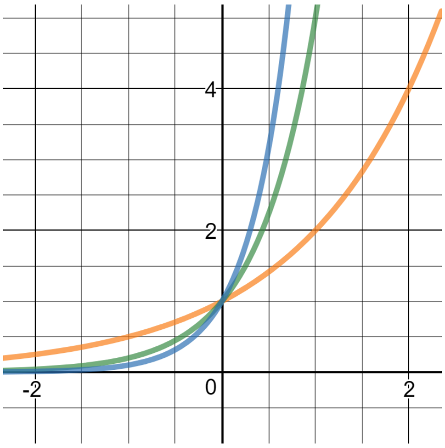
k(x) → as independent variable (x) increases,
the dependent variable(y) also increases, slowly at first and then quickly.

Show with DESMOS?

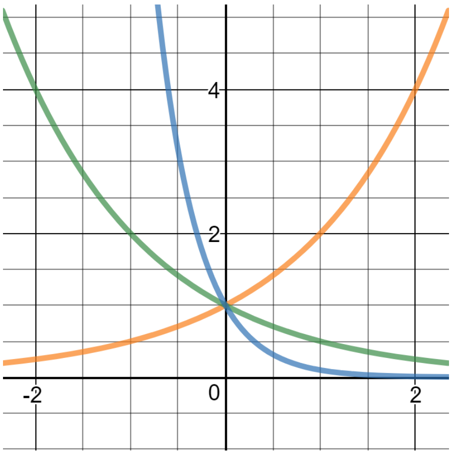
C https://www.desmos.com/calculator/dcbvlufgmb



F https://www.desmos.com/calculator/snogpkesaw

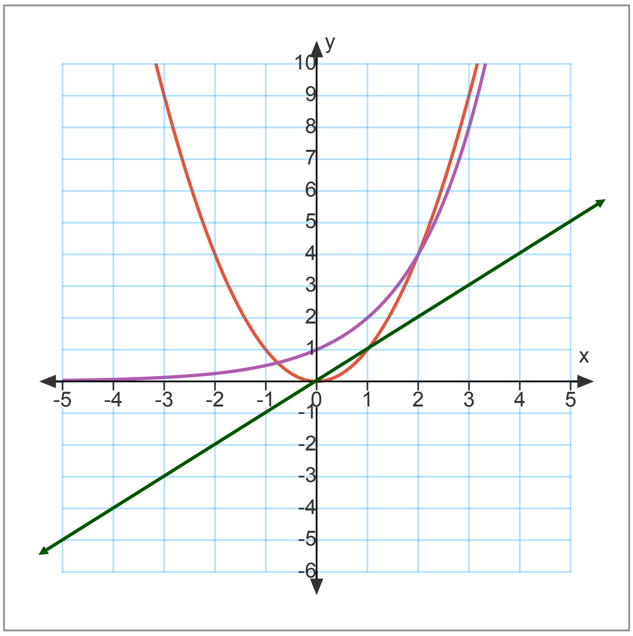


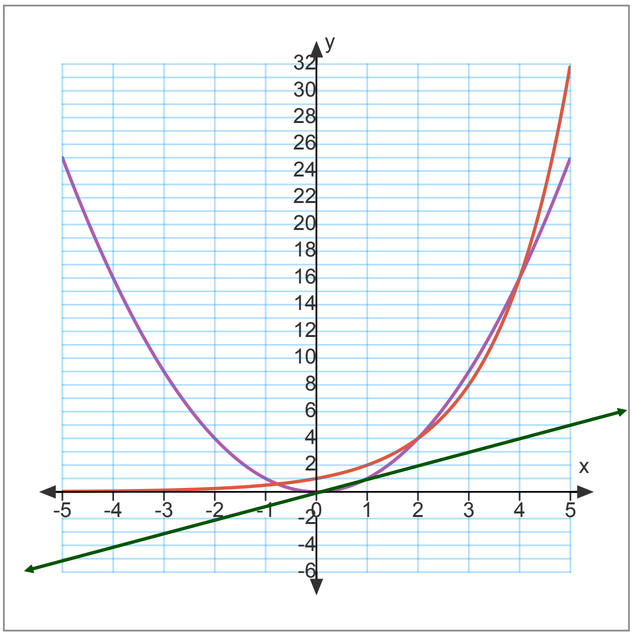
I https://www.desmos.com/calculator/yabmbc4wcd



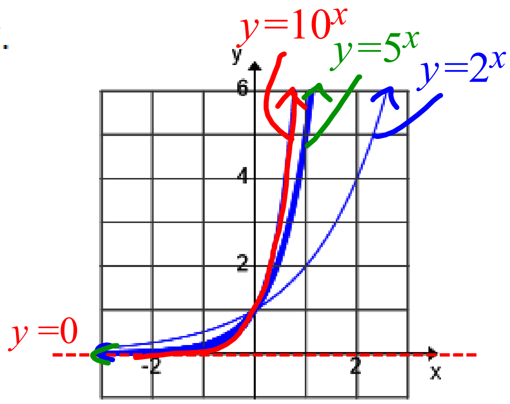
$y = x$ $y = x^2$ $y = x^2$ $y = 2^x$

$y = 2^x$





F.

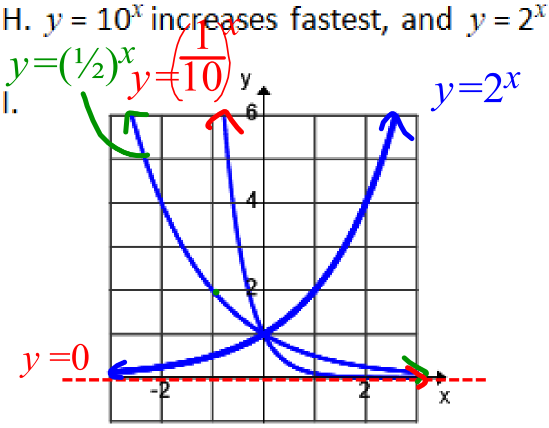


Reminder:
Asymptotes MUST always be drawn and labelled.

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 Asymptote [H.A.] 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
- H.A.: $y = 0$ (x-axis) [Horizontal Asymptote]
- 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.

Today's Homework Practice includes:

pp. 240-241 A - P
READ p. 242
p. 243 #1, 2