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

**READ** p. 422 "In Summary"          **AND**    Complete pp. 423 # 1, 3

## Today's Learning Goal(s):

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

a)  Examine the features of exponential functions and compare them with the graphs of linear and quadratic functions.
b)  Graph an exponential function (growth and decay).
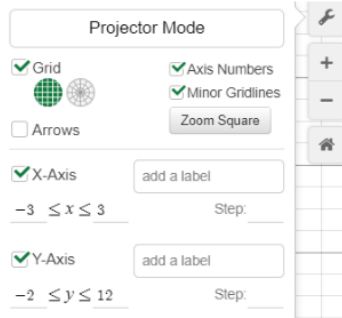
*"In Danger of Failing" List*

Learning Goal(s): a) Examine various changes to the graphs of exponential functions.

MCF 3MI        7.5 Exploring the Properties of Exponential Functions        Date: _____

DESMOS Activity for Exponential Functions

Sign in to desmos.com on your Chromebook, and use the Graph Settings 🔧 shown.

**Projector Mode**

☑ Grid        ☑ Axis Numbers        +
                ☑ Minor Gridlines
                Zoom Square
☐ Arrows                                🏠

☑ X-Axis        add a label
$-3 \le x \le 3$        Step:

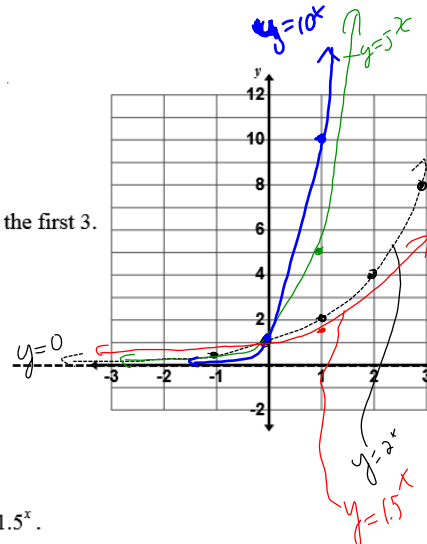☑ Y-Axis        add a label
$-2 \le y \le 12$        Step:

**Part A:** Name your file "7.5 Part A"

a) Graph $f(x) = 2^x$.

b) Don't delete a, then graph $f(x) = 5^x$.

c) Don't delete a or b, then graph $f(x) = 10^x$.

d) Predict where the graph of $f(x) = 1.5^x$ will be compared to the first 3.

Now graph $f(x) = 1.5^x$ to check your prediction.

Conclusion:

As the value of "b" increases,
the graph increases more quickly for $x > 0$.

**Part B**

a) Turn off the graphs of $f(x) = 5^x$, $f(x) = 10^x$, and $f(x) = 1.5^x$.

b) Don't turn off $f(x) = 2^x$, and now graph $f(x) = 0.5^x$.

c) What do you notice about the relationship between these two functions?

d) Don't delete a or b, then graph $f(x) = 0.25^x$.

e) Predict what the graph of $f(x) = 0.75^x$ will look like
compared to the first 3.
Now graph $f(x) = 0.75^x$ to check your prediction.

Conclusion:

$\left(\frac{1}{2}\right)^{-1}$

$= \left(\frac{2}{1}\right)^{x}$
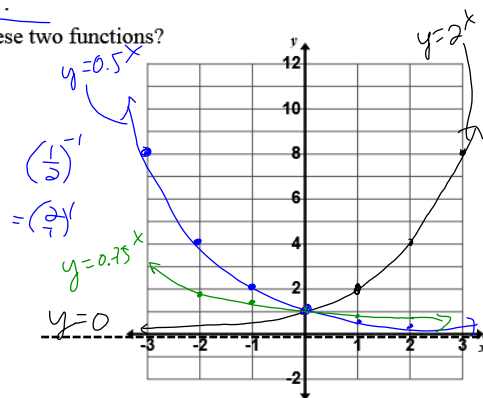
asymptote

$y = (0.75)^x$

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

| x | y |
|---|---|
| -2 | $\left(\frac{3}{4}\right)^{-2} = \left(\frac{4}{3}\right)^2 = \frac{16}{9}$ |
| -1 | $\left(\frac{3}{4}\right)^{-1} \rightarrow \left(\frac{4}{3}\right)^1$ |
| 0 | |
| 1 | $\frac{3}{4} = 0.75$ |
| 2 | $\left(\frac{3}{4}\right)^2 = \frac{9}{16}$ |

$= 0.5625$

Part C:  Before continuing, save your work, then rename your file "7.5 Part C".
   Reminder: Asymptotes **MUST always** be drawn and labelled.

a)  Delete all graphs except $f(x) = 2^x$.

b)  Predict what the graph of $f(x) = 2^x + 2$ will look like
   compared to $f(x) = 2^x$.
   Now graph $f(x) = 2^x + 2$ to check your prediction.

c)  Predict what the graph of $f(x) = 2^x + 4$ will look like
   compared to $f(x) = 2^x$.
   Now graph $f(x) = 2^x + 4$ to check your prediction.

d)  Predict what the graph of $f(x) = 2^x - 1$ will look like
   compared to $f(x) = 2^x$.
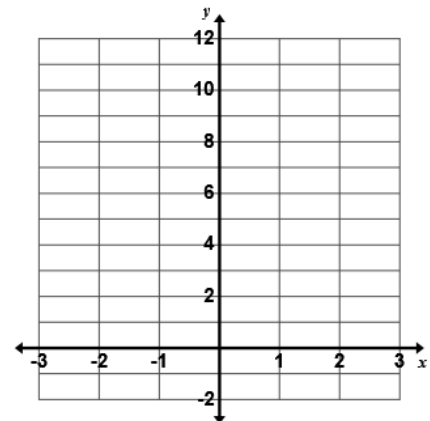   Now graph $f(x) = 2^x - 1$ to check your prediction.
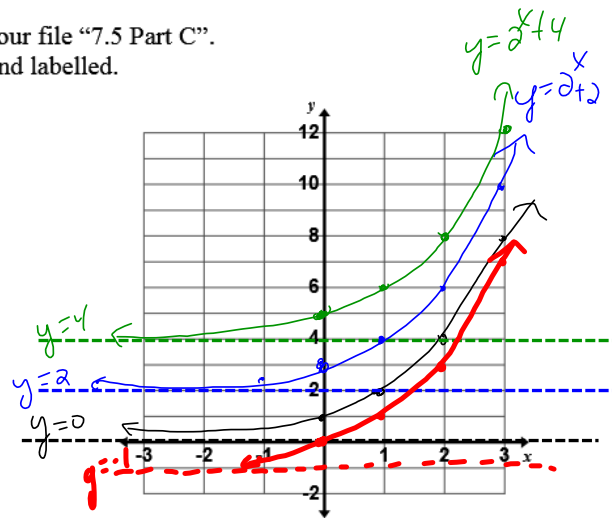
Conclusion:
[Note the change in asymptote.]

Part D:  Before continuing, save your work,
   then rename your file "7.5 Part D".

a)  Delete all graphs.

b)  Predict what the graph of $f(x) = 0.5^x + 3$ will look like.
   Now graph $f(x) = 0.5^x + 3$ to check your prediction.

c)  Predict what the graph of $f(x) = 0.5^x + 1$ will look like.
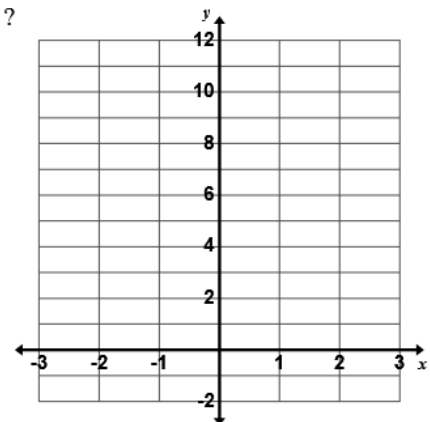   Now graph $f(x) = 0.5^x + 1$ to check your prediction.

Part E:  Before continuing, save your work,
   then rename your file "7.5 Part E".

a)  Delete all graphs.  Graph $f(x) = 2^x$.

b)  Graph $f(x) = 3(2^x)$.  How does this graph compare to $f(x) = 2^x$?

c)  Predict what the graph of $f(x) = 0.5(2^x)$ will look like.
   Now graph $f(x) = 0.5(2^x)$ to check your prediction.

   Save your work, then rename your file "7.5 Part F".

Change the Graph Settings ⚙ by adjusting the Range on the Y-Axis. Set lower limit to -8.
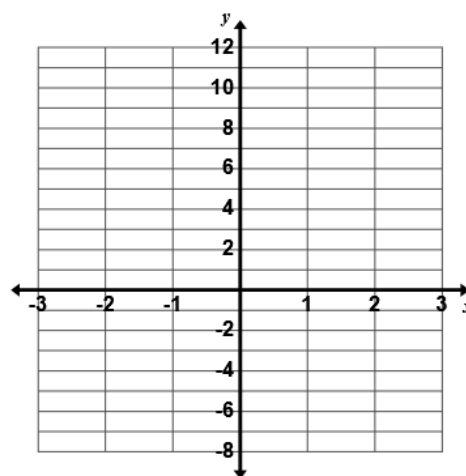
| Projector Mode |
|---|

☑ Grid          ☑ Axis Numbers          ➕
                ☑ Minor Gridlines        ➖
                Zoom Square
☐ Arrows                                 🏠

☑ X-Axis      [add a label]

−3 ≤ x ≤ 3                Step:

☑ Y-Axis      [add a label]
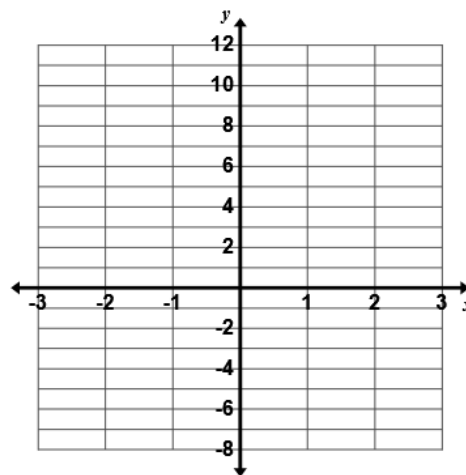
−8 ≤ y ≤ 12               Step:

**Part F:** Before continuing, delete all graphs.

a) Graph $f(x) = -(2^x)$.

b) Predict what the graph of $f(x) = -3(2^x)$ will look like.

   Now graph $f(x) = -3(2^x)$ to check your prediction.

c) Predict what the graph of $f(x) = -(0.3^x)$ will look like.

   Now graph $f(x) = -(0.3^x)$ to check your prediction.

**Part G:** Before continuing, save your work,
        then rename your file "7.5 Part G"   .

a) Delete all graphs. Graph $f(x) = 2^x$.

b) Predict what the graph of $f(x) = 2^{x-1}$ will look like.

   Now graph $f(x) = 2^{x-1}$ to check your prediction.
   You may need brackets in the exponent; $f(x) = 2^{(x-1)}$

c) The graph of $f(x) = 2^x$ is translated 2 units to the left.
   Write the new equation. Check using desmos.

Homework: pp. 423-424 # 2, 4