Name:_____ Hour: _____ Date: _____

NOTES: Section 7.3 – Use Functions Involving *e*

Goals: #1 - I can graph an exponential function with a natural base.

#2 - I can use the natural base in a real life application.

#3 - I can model continuously compounded interest.   😎 😬 😢

Homework: Lesson 7.3 Worksheet

Warm Up:

1. $f(x) = 3\left(\frac{1}{4}\right)^{x+2} + 2$

   domain: _____

   range: _____

2. A new laptop computer costs $1500. The value of the computer decreases by 22% each year.

   a. Write an exponential decay model to represent the situation.

   b. Estimate the value of the computer after 2 years.

Exploration #1: Work with a partner and answer the following questions.

   1. Complete the table of vaules by using your calculator.

x	10^1	10^2	10^3	10^4	10^5	10^6
$\left(1+\frac{1}{x}\right)^x$						

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Notes:

We have worked with _____ numbers such as _____ and _____.

Another special number is called the _____ and is denoted by the letter _____ (the Euler number).

The natural base e is _____, so we cannot find its exact value. It is defined as:

$$\text{As } n \text{ approaches } +\infty, \left(1 + \frac{1}{n}\right)^n \text{ approaches } e \approx 2.718281828$$

Find the e button on your calculator and write the approximation:_____.

Example #1: Simplify the expression.

1. $e^6 \cdot e^3$
2. $\frac{18e^6}{2e^4}$
3. $(4e^{3x})^2$

You practice: Simplify the expression.

1. $2e^{-3} \cdot 6e^5$
2. $(10e^{-4x})^3$

Example #2: Use a calculator to evaluate the expression.

1. e^{-2}
2. $e^{0.3}$

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Exploration #2: Work with a partner and answer the following questions.

1. Use your calculator to complete the table.

x	-2	-1	0	1	2
$y = e^x$					

2. Graph the function $y = e^x$ using your table. Then state the domain and range.
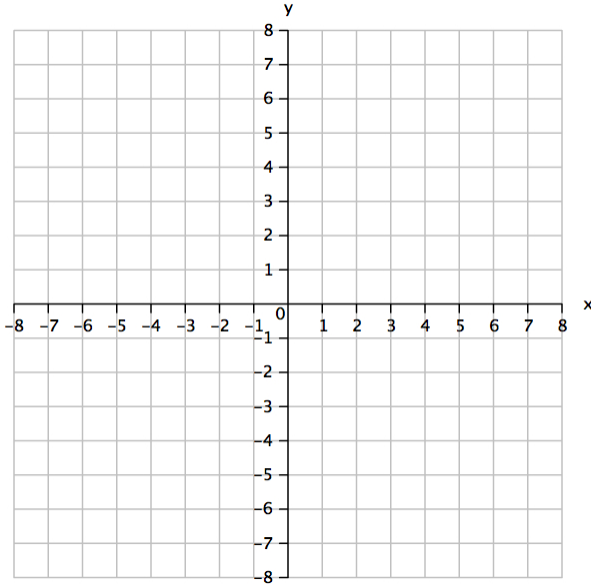
domain: _____

range: _____

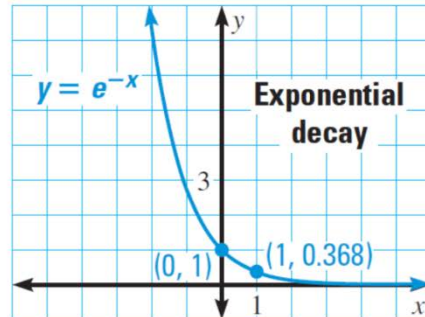3. Use your calculator to complete the table.

x	-2	-1	0	1	2
$y = e^{-x}$					

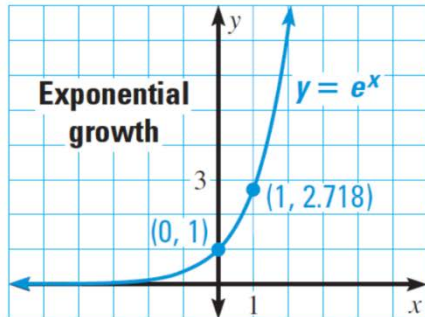4. Graph the function $y = e^{-x}$ using your table. Then state the domain and range.

domain: _____

range: _____

Notes:

A function of the form _____ is called a natural base exponential function.

- If _____, the function is an exponential _____ function.

- If _____, the function is an exponential _____ function.

The graphs of the basic functions $y = e^x$ and $y = e^{-x}$ are shown below.

Example #3: Tell whether the function is an example of *exponential growth* or *exponential decay.*
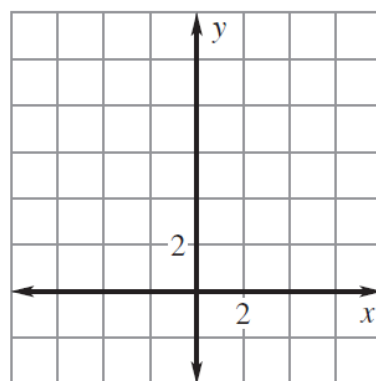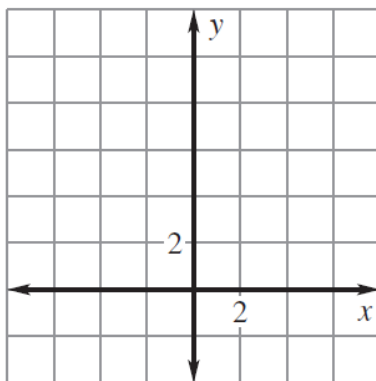
1. $f(x) = \frac{1}{4}e^{-3x}$

2. $f(x) = 2e^{2x}$

Example #4: Graph the function. State the domain and range.

1. $y = 3e^{0.25x}$

2. $y = e^{-0.75(x-2)} + 1$
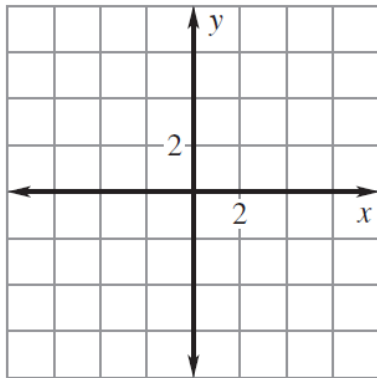

domain: _____

range: _____

domain: _____

range: _____

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You practice: Graph the function. State the domain and range.

1. $y = 1.5e^{0.25(x - 1)} - 2$

domain: _____

range: _____

Notes:

In Section 7.1, we learned about _____:

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

As the number of times interest in compounded increases, it approaches _____

compounded interest which is given by the formula:

Example #5: You deposit $3500 in an account that pays 4% annual interest. What is the balance after 1 year?

1. What is the balance if the interest is compounded monthly?

2. What is the balance if the interest is compounded continuously?