FL State Adoption Bid # 3694

Eureka Math™ Exit Ticket Packet

Algebra I Module 3

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Name _____ Date _____

Lesson 1: Integer Sequences—Should You Believe in Patterns?

Exit Ticket

1. Consider the sequence given by a plus 8 pattern: $2, 10, 18, 26, \ldots$.

   Shae says that the formula for the sequence is $f(n) = 8n + 2$. Marcus tells Shae that she is wrong because the formula for the sequence is $f(n) = 8n - 6$.

   a. Which formula generates the sequence by starting at $n = 1$? At $n = 0$?

   b. Find the 100^{th} term in the sequence.

2. Write a formula for the sequence of cube numbers: $1, 8, 27, 64, \ldots$.

Name _____ Date _____

Lesson 2: Recursive Formulas for Sequences

Exit Ticket

1. Consider the sequence following a minus 8 pattern: $9, 1, -7, -15, \ldots$.
   a. Write an explicit formula for the sequence.

   b. Write a recursive formula for the sequence.

   c. Find the 38^{th} term of the sequence.

2. Consider the sequence given by the formula $a(n+1) = 5a(n)$ and $a(1) = 2$ for $n \geq 1$.
   a. Explain what the formula means.

   b. List the first five terms of the sequence.

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Lesson 3: Arithmetic and Geometric Sequences

Exit Ticket

1. Write the first three terms in the following sequences. Identify them as arithmetic or geometric.
   a. $A(n+1) = A(n) - 5$ for $n \geq 1$ and $A(1) = 9$

   b. $A(n+1) = \frac{1}{2}A(n)$ for $n \geq 1$ and $A(1) = 4$

   c. $A(n+1) = A(n) \div 10$ for $n \geq 1$ and $A(1) = 10$

2. Identify each sequence as arithmetic or geometric. Explain your answer, and write an explicit formula for the sequence.
   a. $14, 11, 8, 5, \ldots$

   b. $2, 10, 50, 250, \ldots$

   c. $-\frac{1}{2}, -\frac{3}{2}, -\frac{5}{2}, -\frac{7}{2}, \ldots$

Name _____ Date _____

Lesson 4: Why Do Banks Pay YOU to Provide Their Services?

Exit Ticket

A youth group has a yard sale to raise money for a charity. The group earns $\$800$ but decides to put its money in the bank for a while. Calculate the amount of money the group will have given the following scenarios:

a. Cool Bank pays simple interest at a rate of 4%, and the youth group leaves the money in for 3 years.

b. Hot Bank pays an interest rate of 3% compounded annually, and the youth group leaves the money in for 5 years.

c. If the youth group needs the money quickly, which is the better choice? Why?

Name _____ Date_____

Lesson 5: The Power of Exponential Growth

Exit Ticket

Chain emails are emails with a message suggesting you will have good luck if you forward the email on to others. Suppose a student started a chain email by sending the message to 3 friends and asking those friends to each send the same email to 3 more friends exactly 1 day after receiving it.

a. Write an explicit formula for the sequence that models the number of people who receive the email on the n^{th} day. (Let the first day be the day the original email was sent.) Assume everyone who receives the email follows the directions.

b. Which day is the first day that the number of people receiving the email exceeds 100?

Name _____ Date_____

Lesson 6: Exponential Growth—U.S. Population and World Population

Exit Ticket

Do the examples below require a linear or exponential growth model? State whether each example is linear or exponential, and write an explicit formula for the sequence that models the growth for each case. Include a description of the variables you use.

1. A savings account accumulates no interest but receives a deposit of $\$825$ per month.

2. The value of a house increases by 1.5% per year.

3. Every year, the alligator population is $\frac{9}{7}$ of the previous year's population.

4. The temperature increases by $2°$ every 30 minutes from 8:00 a.m. to 3:30 p.m. each day for the month of July.

5. Every 240 minutes, $\frac{1}{3}$ of the rodent population dies.

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Lesson 7: Exponential Decay

Exit Ticket

A huge Ping-Pong tournament is held in Beijing with $65{,}536$ participants at the start of the tournament. Each round of the tournament eliminates half the participants.

a. If $p(r)$ represents the number of participants remaining after r rounds of play, write a formula to model the number of participants remaining.

b. Use your model to determine how many participants remain after 10 rounds of play.

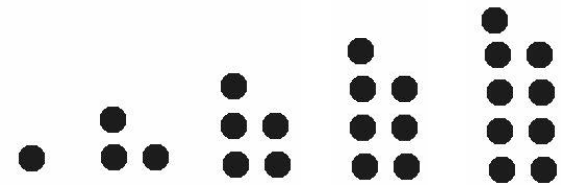
c. How many rounds of play will it take to determine the champion Ping-Pong player?

Name _____ Date _____

Lesson 8: Why Stay with Whole Numbers?

Exit Ticket

Recall that an odd number is a number that is one more than or one less than twice an integer. Consider the sequence formed by the odd numbers $\{1,3,5,7, \ldots\}$.



1. Find a formula for $O(n)$, the n^{th} odd number starting with $n = 1$.

2. Write a convincing argument that 121 is an odd number.

3. What is the meaning of $O(17)$?

Name _____ Date _____

Lesson 9: Representing, Naming, and Evaluating Functions

Exit Ticket

1. Given f as described below.
   $f: \{\text{whole numbers}\} \to \{\text{whole numbers}\}$
   Assign each whole number to its largest place value digit.
   For example, $f(4) = 4$, $f(14) = 4$, and $f(194) = 9$.

   a. What is the domain and range of f?

   b. What is $f(257)$?

   c. What is $f(0)$?

   d. What is $f(999)$?

   e. Find a value of x that makes the equation $f(x) = 7$ a true statement.

2. Is the correspondence described below a function? Explain your reasoning.
   $M: \{\text{women}\} \to \{\text{people}\}$
   Assign each woman her child.

Name _____ Date _____

Lesson 10: Representing, Naming, and Evaluating Functions

Exit Ticket

1. Let $f(x) = 4(3)^x$. Complete the table shown below.

x	-1	0	1	2	3
$f(x)$					

2. Jenna knits scarves and then sells them on Etsy, an online marketplace. Let $C(x) = 4x + 20$ represent the cost C in dollars to produce 1 to 6 scarves.
   a. Create a table to show the relationship between the number of scarves x and the cost C.

   b. What are the domain and range of C?

   c. What is the meaning of $C(3)$?

   d. What is the meaning of the solution to the equation $C(x) = 40$?

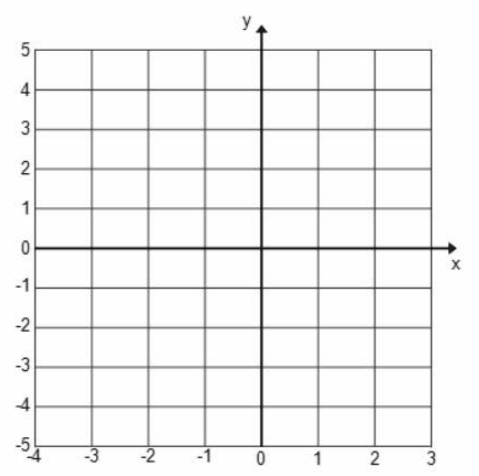
Name _____ Date _____

Lesson 11: The Graph of a Function

Exit Ticket

1. Perform the instructions for the following programming code as if you were a computer and your paper were the computer screen.

Declare x integer
Let $f(x) = 2x + 1$
Initialize G as {}
For all x from -3 to 2
Append $(x, f(x))$ to G
Next x
Plot G



2. Write three or four sentences describing in words how the thought code works.

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Lesson 12: The Graph of the Equation $y = f(x)$

Exit Ticket

1. Perform the instructions in the following programming code as if you were a computer and your paper were the computer screen:

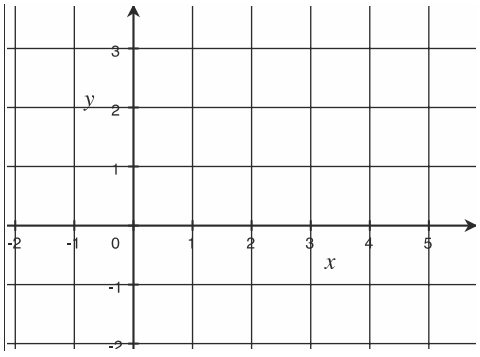
```
Declare x integer
For all x from 2 to 7
    If x + 2 = 7 then
        Print True
    else
        Print False
    End if
Next x
```

2. Let $f(x) = -\frac{1}{2}x + 2$ for x in the domain $0 \leq x \leq 4$.

   a. Write out in words the meaning of the set notation:

   $$\{(x, y) \mid 0 \leq x \leq 4 \text{ and } y = f(x)\}.$$

   b. Sketch the graph of $y = f(x)$.



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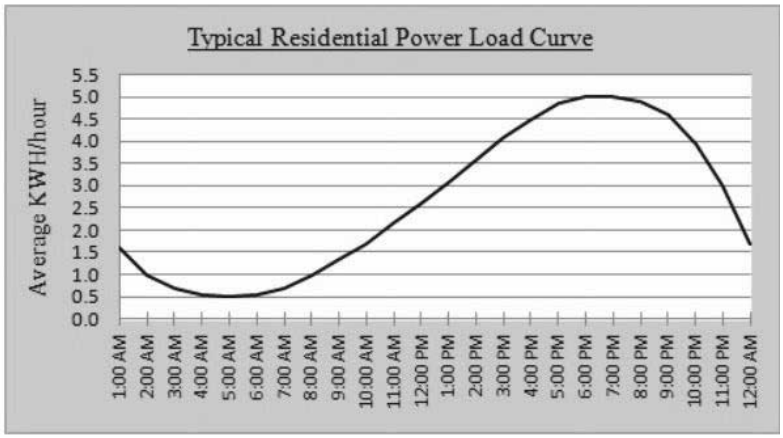
Lesson 13: Interpreting the Graph of a Function

Exit Ticket

1. The following graph is a "power load curve" for typical U.S. residences. Estimate the time interval(s) when power use is typically decreasing. Why would power usage be decreasing during those time interval(s)?



Courtesy The Energy Collective

2. On hot summer days energy use changes from decreasing to increasing and from increasing to decreasing more frequently than it does on other days. Why do you think this occurs?

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Lesson 14: Linear and Exponential Models—Comparing Growth Rates

Exit Ticket

A big company settles its new headquarters in a small city. The city council plans road construction based on traffic increasing at a linear rate, but based on the company's massive expansion, traffic is really increasing exponentially.

What are the repercussions of the city council's current plans? Include what you know about linear and exponential growth in your discussion.

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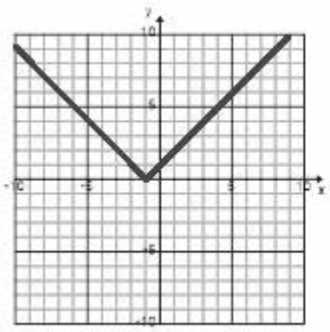
Lesson 15: Piecewise Functions

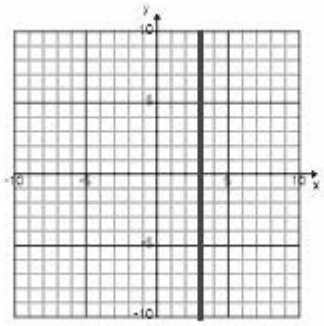
Exit Ticket

Each graph shown below represents the solution set to a two-variable equation.

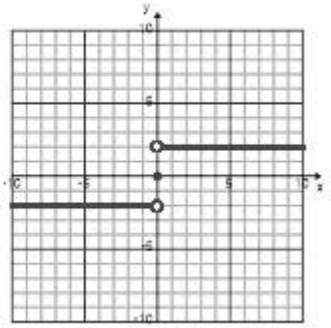
Graph A



Graph B



Graph C



1. Which of these graphs could be represented by a function? Explain your reasoning.

2. For each one that can be represented by a function, define a piecewise function whose graph would be identical to the solution set shown.

Name _____ Date _____

Lesson 16: Graphs Can Solve Equations Too

Exit Ticket

1. How do intersection points of the graphs of two functions f and g relate to the solution of an equation in the form $f(x) = g(x)$?

2. What are some benefits of solving equations graphically? What are some limitations?

Name _____ Date _____

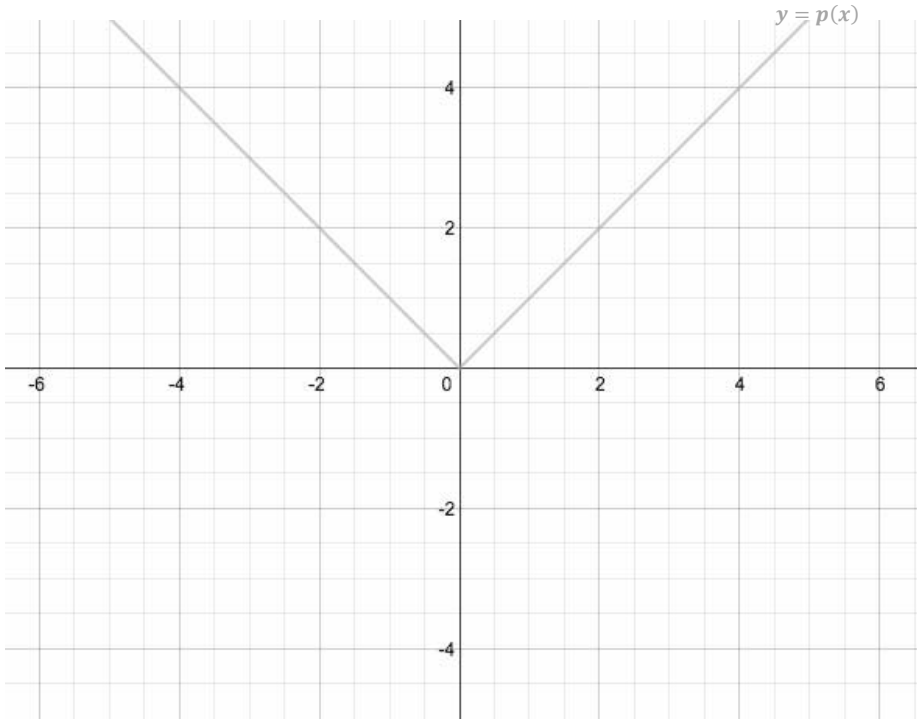
Lesson 17: Four Interesting Transformations of Functions

Exit Ticket

Let $p(x) = |x|$ for every real number x. The graph of $y = p(x)$ is shown below.

1. Let $q(x) = -\frac{1}{2}|x|$ for every real number x. Describe how to obtain the graph of $y = q(x)$ from the graph of $y = p(x)$. Sketch the graph of $y = q(x)$ on the same set of axes as the graph of $y = p(x)$.

2. Let $r(x) = |x| - 1$ for every real number x. Describe how to obtain the graph of $y = r(x)$ from the graph of $y = p(x)$. Sketch the graph of $y = r(x)$ on the same set of axes as the graphs of $y = p(x)$ and $y = q(x)$.



Name _____ Date _____

Lesson 18: Four Interesting Transformations of Functions

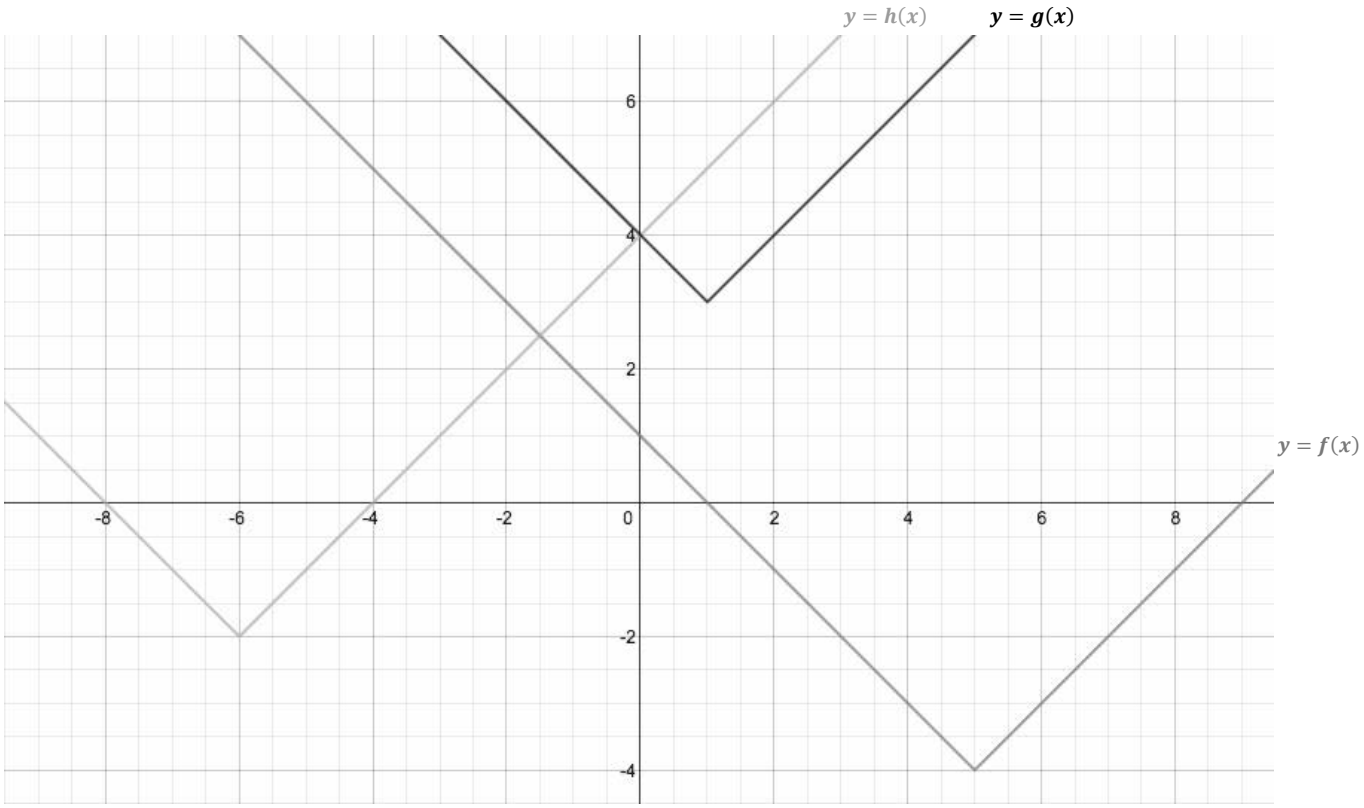
Exit Ticket

Write the formula for the functions depicted by the graphs below:

a. $f(x) =$ _____

b. $g(x) =$ _____

c. $h(x) =$ _____



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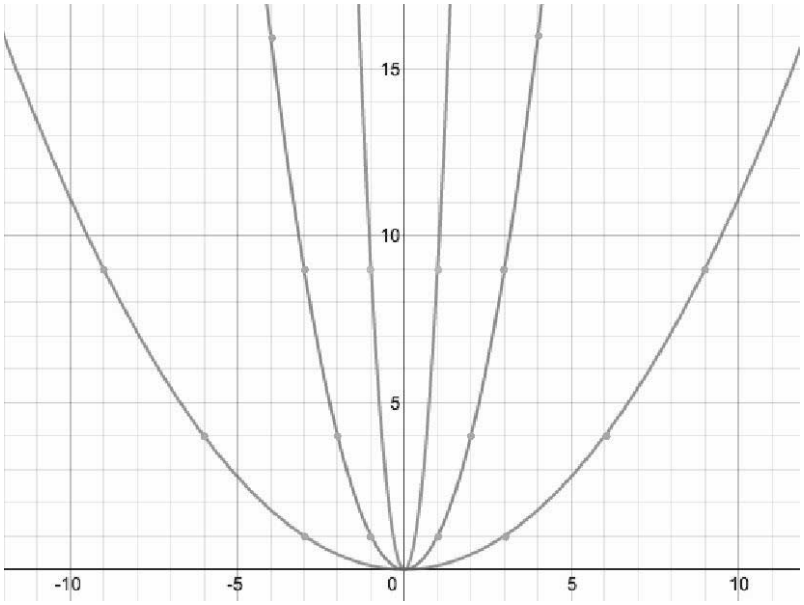
Lesson 19: Four Interesting Transformations of Functions

Exit Ticket



Let $f(x) = x^2$, $g(x) = (3x)^2$, and $h(x) = \left(\frac{1}{3}x\right)^2$, where x can be any real number. The graphs above are of $y = f(x)$, $y = g(x)$, and $y = h(x)$.

1. Label each graph with the appropriate equation.

2. Describe the transformation that takes the graph of $y = f(x)$ to the graph of $y = g(x)$. Use coordinates of each to illustrate an example of the correspondence.

3. Describe the transformation that takes the graph of $y = f(x)$ to the graph of $y = h(x)$. Use coordinates to illustrate an example of the correspondence.

Name _____ Date _____

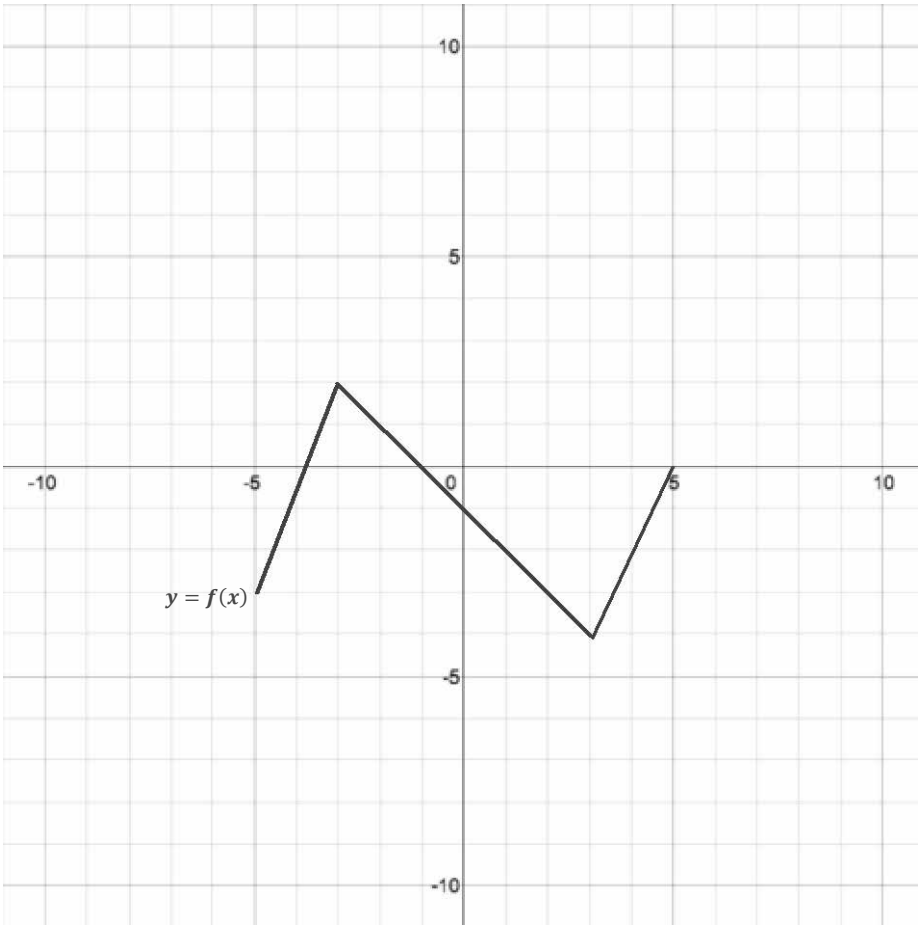
Lesson 20: Four Interesting Transformations of Functions

Exit Ticket

The graph of a piecewise function f is shown below.

Let $p(x) = f(x-2)$, $q(x) = \frac{1}{2}f(x-2)$, and $r(x) = \frac{1}{2}f(x-2)+3$.

Graph $y = p(x)$, $y = q(x)$, and $y = r(x)$ on the same set of axes as the graph of $y = f(x)$.



Name _____ Date_____

Lesson 21: Comparing Linear and Exponential Models Again

Exit Ticket

Here is a classic riddle: Mr. Smith has an apple orchard. He hires his daughter, Lucy, to pick apples and offers her two payment options:

Option A: $\$1.50$ per bushel of apples picked

Option B: 1 cent for picking one bushel, 3 cents for picking two bushels, 9 cents for picking three bushels, and so on, with the amount of money tripling for each additional bushel picked

a. Write a function to model each option.

b. If Lucy picks six bushels of apples, which option should she choose?

c. If Lucy picks 12 bushels of apples, which option should she choose?

d. How many bushels of apples does Lucy need to pick to make Option B better for her than Option A?

Name _____ Date_____

Lesson 22: Modeling an Invasive Species Population

Exit Ticket

1. For the equation found in Exercise 8, explain the parameters of the equation within the context of the problem.

2. Given each of the following, describe what features in the data or graph make it apparent that an exponential model would be more suitable than a linear model.
   a. The table of data

   b. The scatter plot

   c. The average rates of change found in Exercise 6

3. Use your equation from Exercise 8 to predict the number of lionfish sightings by year 2020. Is this prediction accurate? Explain.

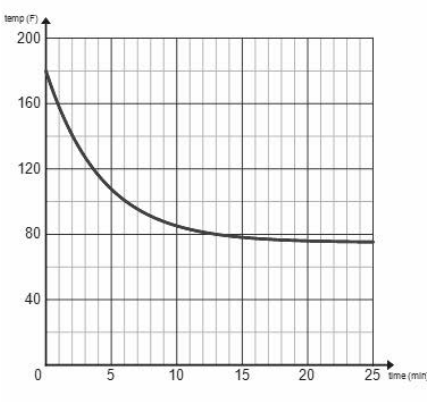
Name _____ Date_____

Lesson 23: Newton's Law of Cooling

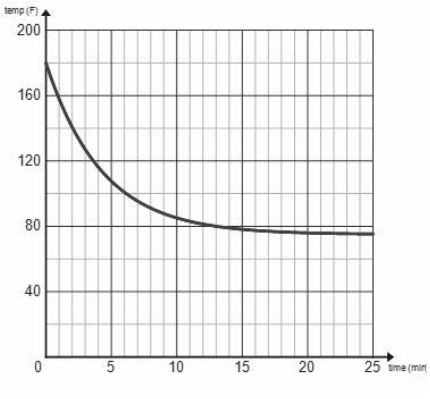
Exit Ticket

Shown below is the graph of Cup 1 from the exercise completed in class. For each scenario, sketch and label a graph of Cup 2 on the same coordinate plane.

1. Cup 2 is poured 10 minutes after Cup 1 (the pot of coffee is maintained at $180°\text{F}$ over the 10 minutes).



2. Cup 2 is immediately taken outside where the temperature is $90°\text{F}$.

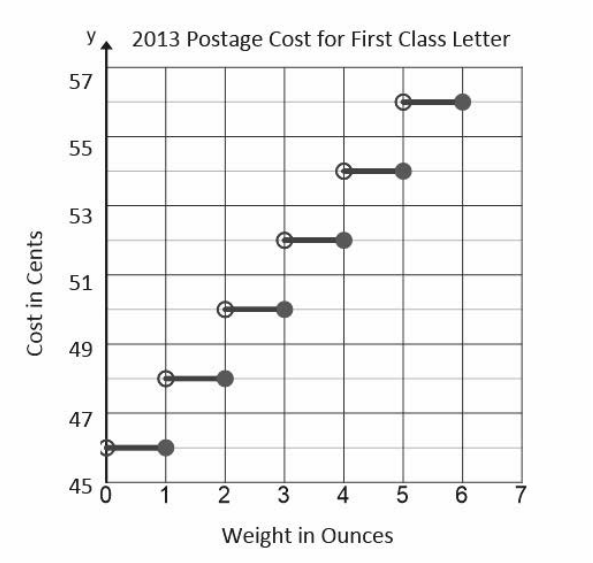


Name _____ Date_____

Lesson 24: Piecewise and Step Functions in Context

Exit Ticket

1. Use the graph to complete the table.



Weight in ounces, x	2	2.2	3	3.5	4
Cost of postage, $C(x)$					

2. Write a formula involving step functions that represents the cost of postage based on the graph shown above.

3. If it cost Trina $\$0.54$ to mail her letter, how many ounces did it weigh?