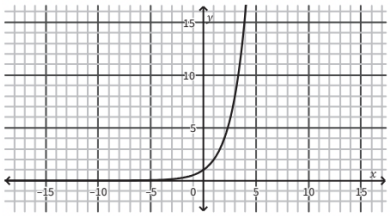
Name:_____ Math 3&4

Math 3&4 Summer Assignment

Question #1

Determine whether the relationships represented are linear, exponential, quadratic, or neither. Then, in the space provided, explain your reasoning.

<table>
<tr>
<td> 
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<td>

x	$f(x)$
1.5	3
2.5	9
3.5	27
5.5	243

</td>
<td>Janet wants to know how many seats are in each row of the theater. Jamal lets her know that each row has 2 seats more than the row in front of it. The first row has seats.</td>
</tr>
<tr>
<td>_____ Linear
_____ Exponential
_____ Quadratic
_____ Neither</td>
<td>_____ Linear
_____ Exponential
_____ Quadratic
_____ Neither</td>
<td>_____ Linear
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_____ Neither</td>
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<tr>
<td>Explanation:</td>
<td>Explanation:</td>
<td>Explanation:</td>
</tr>
</table>

Question #2
Use the given form of the expression to write the equivalent form.

Radical Form:	Exponential Form: $x^{\frac{2}{3}} \cdot y^{\frac{5}{3}}$
Radical Form: $\sqrt[5]{\frac{a^3 \cdot b^7}{a^2 \cdot b^{-3}}}$	Exponential Form:

Question #3
Create two different explicit equations that describe the values in the table. Use a different point in the table for each of the equations you create.

x	$f(x)$
57	-49
58	-42
59	-35
60	-28

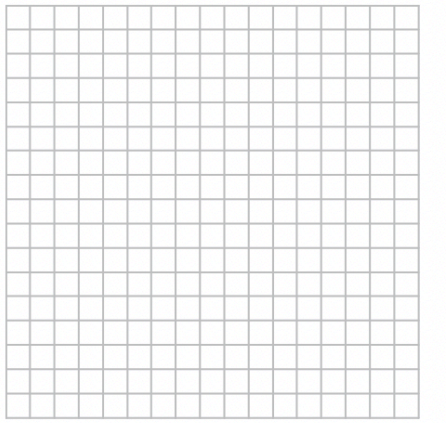
Explicit Equation:

Explicit Equation:

Question #4

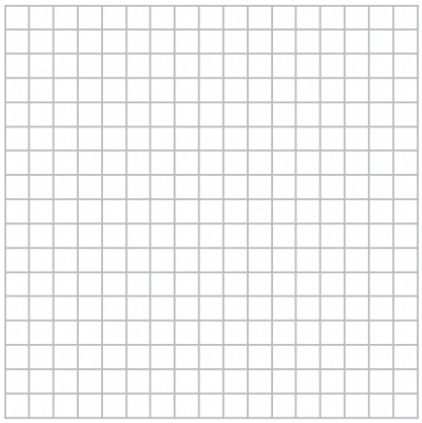
a. Graph f(x) as a continuous function with a domain of all real numbers

x	$f(x)$
0	50
1	80
2	110
3	140



b. Given that $g(x) = 2 \cdot 4^x$, fill in the table with the output values for g(x). Then graph the function:

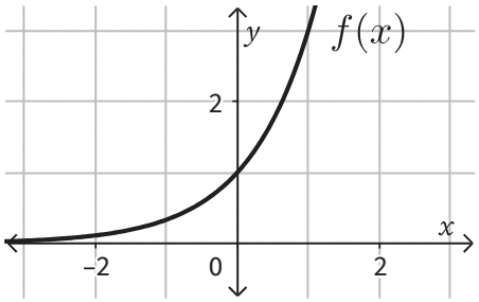
x	$g(x)$
0	
1	
2	
3	



c. As the inputs for f(x) and g(x) increase, which function produces larger outputs? Explain.

Question #5

Use the graph of $f(x) = 3^x$ for the following questions.

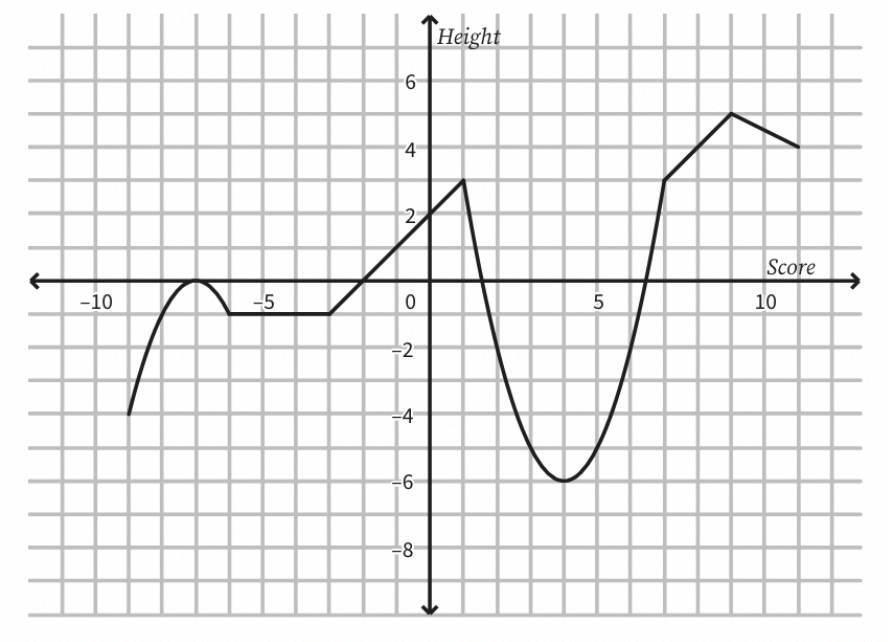


a. Rewrite $\sqrt[5]{3^4}$ as an expression with a rational exponent. Then mark this number on the graph of $f(x) = 3^x$. Explain how you know where to place it.

b. Graph $g(x) = 3^{-x}$ on the graph of f(x) in Question #4. Explain how the graphs of the two functions can be used to explain the meaning of a negative exponent.

c. Rewrite $g(x) = 3^{-x}$ when $x = \frac{7}{5}$. Write this as an expression with a positive rational exponent and as an expression involving a radical. Show where $g(\frac{7}{5})$ would be located on the graph.

Question #6



a. Write the domain for the function.

b. Identify the coordinates of the minimum.

c. Identify the coordinates of the maximum.

d. Identify the range of the function.

e. Identify an interval where the function is increasing.

f. Identify the coordinates of the y-intercept.

g. Identify the coordinates of an x-intercept.

h. Identify an interval where the function is decreasing.

i. Identify an interval where the function is considered constant.

Question #7

A river in one part of the Rocky Mountains has a flow rate of 250 cubic meters of water per second. The flow of the water can be modeled mathematically with the function, $w(t) = 250t$, where $w(t)$ represents the volume of the water in cubic meters, at time t, in seconds.

a. Find $w(30)$ and explain what it means in this situation.

b. What would $w(t) = 3,250$ mean in this situation?

c. Find the number of cubic meters of water that have flowed down the river in 5 minutes.

d. How long will it take for 100,000 cubic meters of water to flow down the river?

Question #8

Willow is driving on the freeway. She just passed mile marker 325. The markers have been increasing as she drives by them. The fastest Willow will drive is 75 miles per hour. However there is a bit of traffic that might slow her down, but she doesn't know exactly how much it will slow her down.

a. Write an inequality to represent Willow's speed.

b. Write an inequality to represent Willow's position relative to the mile markers two hours from now.

Question #9
Rewrite this equation in slope-intercept form.

$$12y + 2x = 24$$

Question #10
Often when solving equations, the steps taken are referred to as “un-doing” the equation. Why do you think this is the case? What is being “un-done”? Explain how you know what the first step in solving an equation should be. If an equation requires several steps to solve, how do you determine the order in which you should do them? (You may use an example in your explanation.)

Question #11
Solve the following system of equations using two different methods (substitution, elimination, or graphing). A student has suggested that this system of equations connects with the Pet Sitting business. Is the solution viable within the context of cats and dogs?

$-x + y = 5$

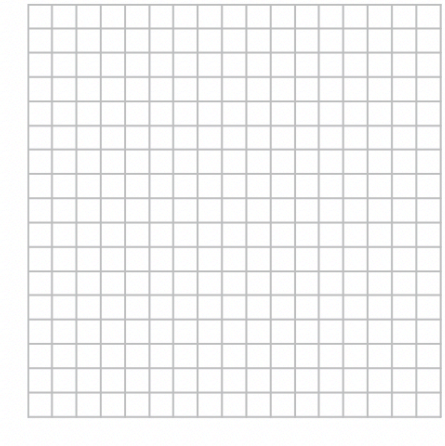
$3x + y = 1$

Question #12

Represent all of the coordinates that are solutions to the system of inequalities.

$3x + 2y > 24$

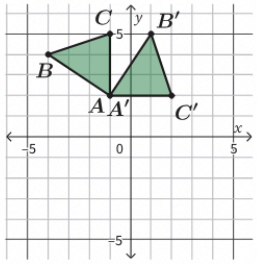
$4x - 5y \leq -20$



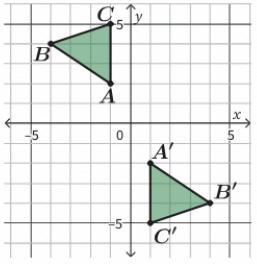
Question #13

Each diagram shows a pre-image and an image. Match each graph with the descriptions of the rigid motion or sequence of rigid motions that transformed the pre-image to its image.

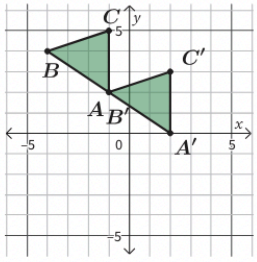
A. _____



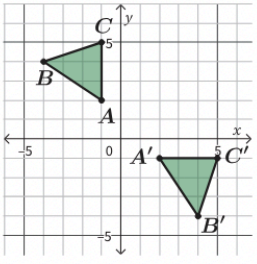
C. _____



B. _____



D. _____



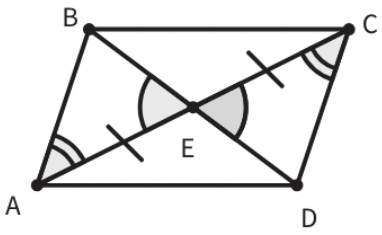
1. Reflected over the line y=x
2. $(x, y) \rightarrow (x + 3, y - 2)$
3. Rotate 90º clockwise around the point (-1, 2)
4. Rotate 180º around the point (0, 0)

Question #14

On the regular hexagon below, draw the lines of reflective symmetry that carry the figure onto itself.

Question #15

Use transformations and the information given in the diagram to create an argument that justifies $\triangle AEB \cong \triangle CED$.

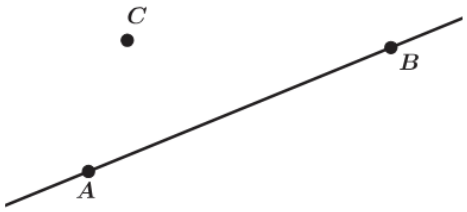


Question #16

Construct an equilateral triangle so that $\overline{AB}$ is one of the sides of the triangle.

Question #17

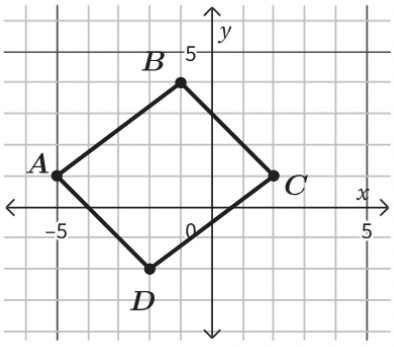
Construct a line through point C that is parallel to line $\overleftrightarrow{AB}$.



Question #18

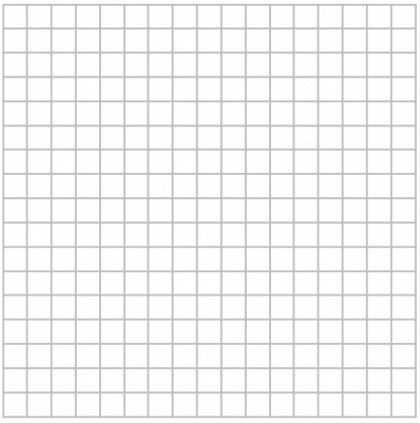
A rectangle is a four sided-polygon, having all the internal angles equal to 90 degrees. The two sides at each corner or vertex meet at right angles. The opposite sides of the rectangle are equal in length which makes it different from a square.

Is quadrilateral ABCD a rectangle? Provide justification for your decision.



Question #19

Write the equation of a line that is perpendicular to $y = \frac{1}{3}x - 2$ and passes through the point (-2, -4). Graph both lines. Justify that the two lines are perpendicular to each other.



Question #20

Use the table's data for the average high temperatures of the two cities in the table.

Average High Temperature in degrees Fahrenheit

Month	1	2	3	4	5	6	7	8	9	10	11	12
Boston	37	39	46	57	67	77	82	81	73	62	52	42
San Diego	66	66	67	68	68	72	76	77	77	74	70	66

Find the mean, median, and standard deviation for each city. Then create comparison statements about the spread and the center of the data, and interpret what the comparison means.

Boston:

Mean Temperature:

Median Temperature:

Standard Deviation:

San Diego:

Mean Temperature:

Median Temperature:

Standard Deviation:

Question #21

A person who is 5 feet tall uses a potato gun to shoot a potato in the air at 100 feet per second. The function $h(t) = -16t^2 + 100t + 5$ models the height of the potato from the ground at any given second, t.

a. Find h(1) and explain what this value means in terms of the context.

b. Find when h(t) = 0. (Estimate to the nearest tenth) Explain what h(t) = 0 means in this context.

c. About how high will the potato get? When will that happen?

Question #22

The quadratic function $f(x) = x^2 - 8x + 7$ models the position of a diver relative to the surface of the water over time. Find the vertex form of the function. Find the minimum value of the function, and state what this value means in terms of the diver's depth in the water.

Question #23

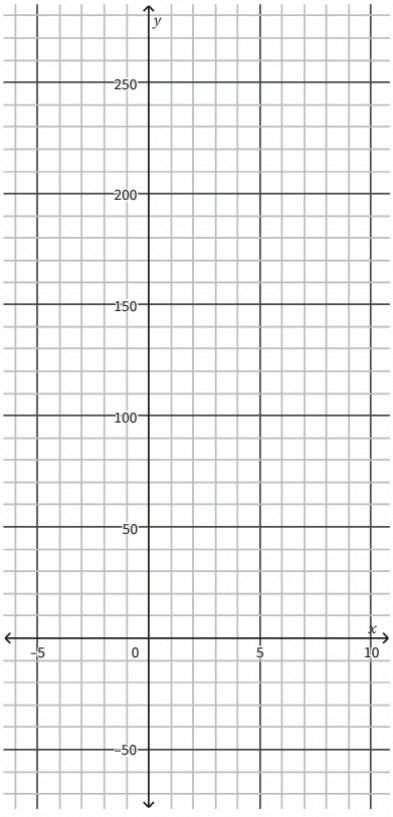
Write an equivalent expression in factored form $x^2 - 6x + 8$.

Question #24

The function $h(t) = -16(t - 3)^2 + 172$ models the height, in feet, of a tennis ball shot from the top of the school into the air after, t, time in seconds.

a. Find the standard form of h(t) and state the -intercept. Explain what the y-intercept means in this context.

b. Create the graph h(t) on the given grid. Make sure the graph shows all of the intercepts and the maximum value.



c. In the context of a tennis ball being shot from the top of a building, explain the meaning of the positive x-intercept.

Question #25

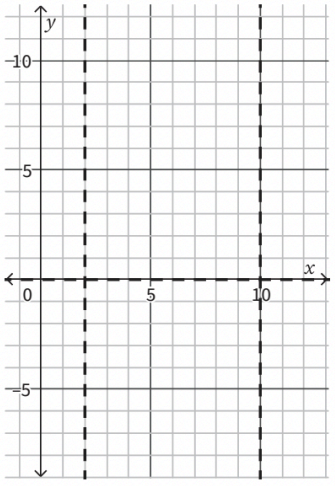
Describe the transformations that take the graph $y = x^2$ to the graph of $y = (x - 2)^2 - 9$.

Question #26

An architect wants to design a window for a building that is shaped like a parabola.

- The border of the window is the part of the parabola between the lines x = 2, x = 10, and y = 0.
- The x-intercepts of the parabola are (2, 0) and (10, 0).
- The parabola has a vertical stretch of ½.
- The vertex of the parabola is a maximum.

a. Draw the window by graphing the parabola described above.



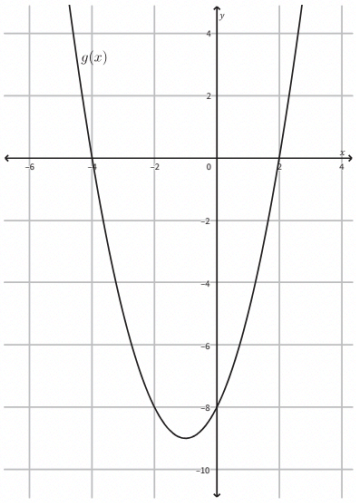
b. Find the factored form of the equation of the parabola. What characteristics of the window do the x-intercepts describe?

c. Find the vertex form of the equation of the parabola. What characteristics of the window does the vertex describe?

d. Find the standard form of the equation of the parabola. What characteristics of the window does the ax^2 term describe?

Question #27

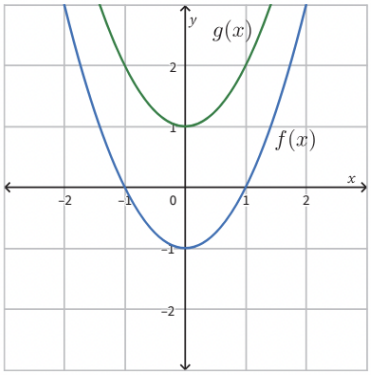
Use the graph of g(x) to select all the statements that are true.



a. The only solutions of g(x) are x = -4 and x = 2.
b. The factored form of g(x) is g(x) = (x+4)(x-2).
c. The solutions for g(x) = 7 are x = -5 and x = 3.
d. The function g(x) has exactly two solutions for every value of x.
e. The graph shows the set of all the solutions of g(x).

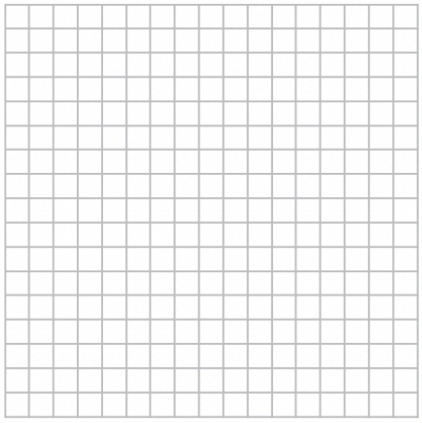
Question #28

Write the equations of f(x) and g(x) as shown in the graph. Then write f(x) and g(x) in factored form.



Question #29

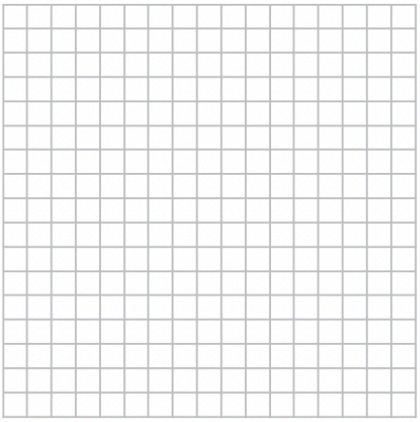
Graph the following absolute value function: $g(x) = |x - 4| - 6$.



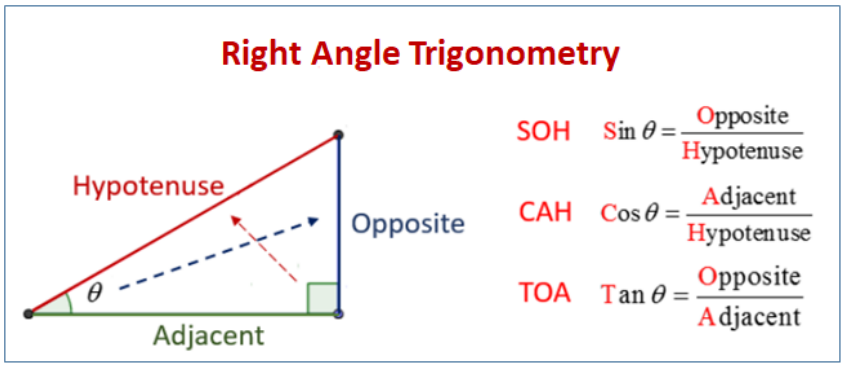
Question #30

Graph the following piecewise function:

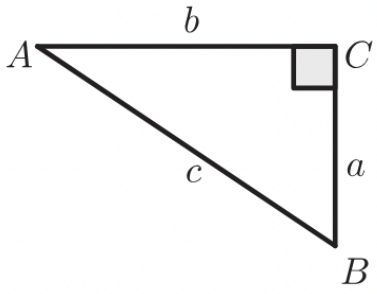
$$f(x) = \begin{cases} -3x - 9, & -5 \le x \le 0 \\ \frac{1}{2}x - 9, & 2 < x \le 6 \\ 2x - 18, & 6 < x \le 8 \end{cases}$$



Question #31



Use $\triangle ABC$ to write the indicated trigonometric ratio.



a. sin(A) = _____

b. cos(A) = _____

c. tan(A) = _____

d. sin(B) = _____

Questio #32

Volume Formulas

rectangular prism: $V = l \times w \times h$

cylinder: $V = \pi r^2 h$

rectangular-based pyramid: $V = \frac{lwh}{3}$

cone: $V = \frac{\pi r^2 h}{3}$

sphere: $V = \frac{4}{3}\pi r^3$

An ice cream shop sells three sizes of ice cream cones as shown on the sign. The small cone for $3.50 is the best seller. Customer feedback about the prices includes comments such as: “The small cone is the best deal. The medium cone is only slightly bigger but almost twice the cost. The large cone is a rip off! It’s almost 3 times the cost and only double in size.”

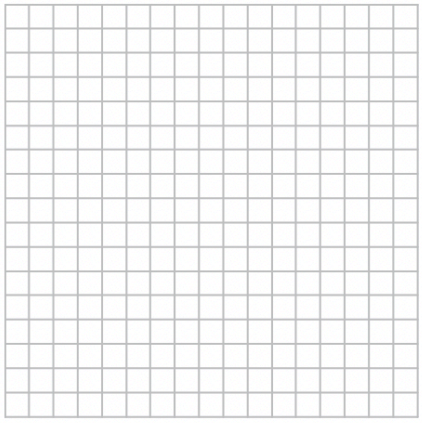
You have been hired for quality control. It’s your job to compare the volume of ice cream in each size cone with scoop of ice cream on top and to recommend price adjustments.

Cones come in three sizes. Each cone has one scoop of ice cream with the same diameter as the mouth of the cone. (Think of a scoop as a sphere.)

cones	diameter at opening	height at tallest
small	1.5 inches	4 inches
medium	2 inches	5 inches
large	3 inches	6 inches

Which cone is the best value? Justify your answer.

Question #33
Write the equation of a circle with center (5, -4) that intersects the point (5, -2). Then, graph the circle on the graph below.



Question #34
Explain, in your own words, what it means for two events to be considered independent in probability. How are independent events different from dependent events? There are rules for independence that you might share; however, you need to also provide an explanation of the meaning of independent events.

Question #35
Rewrite the equation using completing the square.

$$f(x) = x^2 + 6x + 7$$