



Program Information	<i>[Lesson Title]</i> Functions		TEACHER NAME Jessica Untch		PROGRAM NAME Parma City School District		
	<i>[Unit Title]</i> Advanced Algebra Topics		NRS EFL(s) 3 – 5		TIME FRAME 120 minutes		
Instruction	<u>ABE/ASE Standards – Mathematics</u>						
	Numbers (N)		Algebra (A)		Geometry (G)		Data (D)
	Numbers and Operation		Operations and Algebraic Thinking		Geometric Shapes and Figures		Measurement and Data
	The Number System		Expressions and Equations	A.3.16 A.4.3 A.4.9	Congruence		Statistics and Probability
	Ratios and Proportional Relationships	N.4.11	Functions	A.4.12 A.4.13 A.5.6	Similarity, Right Triangles. And Trigonometry		Benchmarks identified in RED are priority benchmarks. To view a complete list of priority benchmarks and related Ohio ABE lesson plans, please see the Curriculum Alignments located on the Teacher Resource Center (TRC).
	Number and Quantity			Geometric Measurement and Dimensions			
				Modeling with Geometry			
	Mathematical Practices (MP)						
	<input checked="" type="checkbox"/>	Make sense of problems and persevere in solving them. (MP.1)			<input type="checkbox"/>	Use appropriate tools strategically. (MP.5)	



<input type="checkbox"/> Reason abstractly and quantitatively. (MP.2)	<input checked="" type="checkbox"/> Attend to precision. (MP.6)
<input type="checkbox"/> Construct viable arguments and critique the reasoning of others. (MP.3)	<input type="checkbox"/> Look for and make use of structure. (MP.7)
<input type="checkbox"/> Model with mathematics. (MP.4)	<input checked="" type="checkbox"/> Look for and express regularity in repeated reasoning. (MP.8)
<p>LEARNER OUTCOME(S)</p> <ul style="list-style-type: none"> Recognize and represent proportional relationships between quantities by graphing lines on a coordinate grid. Use variables to represent quantities in a real-world or mathematical problems and show this in four ways: with a verbal description, an equation, a graph, and a table. Graph proportional relationships, interpreting the unit rate as the slope of the graph. Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales Understand that a function is a rule that assigns to each input exactly one output by graphing ordered pairs from a function table Interpret the equation $y = mx + b$ as defining a linear function, and show this by graphing lines on the coordinate grid. 	<p>ASSESSMENT TOOLS/METHODS</p> <p>Formative:</p> <ul style="list-style-type: none"> Review graphing linear equations at the beginning of class to see how well students recall the concepts. Walk around the room while students work on practice problems, checking in with student groups to see if they need extra help. <p>Summative:</p> <ul style="list-style-type: none"> Grade final worksheet for accuracy - were students able to create a verbal description, a table, and a graph from the word problem?
<p>LEARNER PRIOR KNOWLEDGE</p> <ul style="list-style-type: none"> Coordinate grid skills, including plotting points, graphing lines, and finding slope. Students should have a well-rounded understanding of these concepts and know how to solve many types of grid/graphing problems. 	



INSTRUCTIONAL ACTIVITIES

1. Review the concept and steps of graphing linear equations from previous lessons and put several different examples on board (see attached worksheet). Show two different methods:
 - a. Make a T-chart to find several ordered pairs for graphing.
 - b. Discuss the $y = mx + b$ format where b is the y -intercept and m is the slope (count out rise & run to plot points).
 - c. Sketch in lines on board using these two different methods, making sure that students copy down the examples.
 - d. Provide student copies of *Linear Equations Practice (attached)* for practice.
 - e. Do these worksheets together as a class and give plenty of support as you go through the problems.

2. Next, give students a few practice problems to make sure that they understand the concept from different angles:
 - a. "Which is the correct equation for the following two ordered pairs (0,1) (6, -2)?" and then give 4 choices: a) $y = -2x + 1$ b) $y = -1/2x - 2$ c) $y = -1/2x + 1$ (this is correct) d) $y = 6x - 2$; or "Is the y -intercept in the equation $y = 4 - 6x$ greater than or less than the y -intercept of the graphed line below?" (show a graphed line on the board).
 - b. This will tell you whether students have a well-rounded understanding of the concepts. If they do not, you may need to re-teach this before moving on to functions, as these tend to be difficult concepts that will take a lot of practice.

RESOURCES

Student copies of *Final Assessment* (attached)

Student copies of *Linear Equations Practice* (attached)

Student copies of *Function Worksheets* (attached)

Computer and projector

White board and markers

Math Worksheets. (n.d.). Retrieved from <http://www.math-aids.com/>

Common Core Algebra I.Unit #3.Lesson #1.Introduction to Functions. (n.d.). Retrieved from <https://www.youtube.com/watch?v=r4F6Y0-uFeQ>

Additional resources

Learn The Math You Need With Our GED Math Test Prep Course. (n.d.). Retrieved from <http://www.mathhelp.com/ged-math-test-prep.php>



	<ul style="list-style-type: none">a. Using a computer and projector, play the video Common Core Algebra I.Unit #3.Lesson #1.Introduction to Functions<ul style="list-style-type: none">a. Take notes while the video is playing so you can review the concepts covered.b. Pause the video when prompted by the online instructor to let students work in groups on math problems.c. While students are working, walk around the room and offer help to those who are struggling. When the video is finished, give a summary of the concepts (function rules, similarity to linear equation graphs, the four ways to define a function) and ask students for feedback.d. Did they like the video? Do they have any questions? Where do they need more practice? <p>3. Take a 15 minute break</p> <p>4. Do some practice with function tables using student copies of <i>Functions Worksheets (attached)</i>.</p> <ul style="list-style-type: none">a. Do half the problems as a large group, and then give students time to work in groups on the rest of the problems. Offer help when needed. <p>5. As a summative assessment, provide student copies of <i>Final Assessment Worksheet (attached)</i> where they are given an equation and asked to define the function in 3 other ways:</p> <ul style="list-style-type: none">a. Using a verbal description.b. Using a table.c. Using a graph.	
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	<p>d. As a bonus question, ask them to identify the slope (m) and y-intercept (b)</p> <p>6. If students want more practice, direct them to the website http://www.mathhelp.com/ged-math-test-prep.php for practice at home.</p>	
	<p>DIFFERENTIATION</p> <ul style="list-style-type: none">• Walk students through several examples as a large group using explicit instruction.• Structure small groups to include low and high level students (allow higher level to help others solve problems).• Give extra assistance to students/groups who have difficulty solving problems.• Allow students to work one-on-one with a tutor, if needed.	



Reflection	TEACHER REFLECTION/LESSON EVALUATION
	ADDITIONAL INFORMATION

Name: _____

Score: _____

FUNCTION TABLE

Complete the function table:

1) $f(x) = x^2 + 4$

x	2	5	7	8	10
$f(x)$					

2) $f(x) = 3x - 5$

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

3) $f(x) = 2x$

x	-2	0	2	4	6
$f(x)$					

4) $f(x) = x^3$

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

5) $f(x) = -x + 2$

x	-5	-4	-3	-2	-1
$f(x)$					

6) $f(x) = 3x^2 - 2x$

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

7) $f(x) = x - 5$

x	3	6	9	12	15
$f(x)$					

8) $f(x) = 2x^2 + 8$

x	1	2	3	4	5
$f(x)$					

9) $f(x) = (x - 1)^3$

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

10) $f(x) = 5x - 8$

x	-7	-6	-5	-4	-3
$f(x)$					

11) $f(x) = x^3 - 1$

x	-4	-2	0	2	4
$f(x)$					

12) $f(x) = 7x^2 - 3$

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

Name: _____

Score: _____

Answers

1) $f(x) = x^2 + 4$

x	2	5	7	8	10
$f(x)$	8	29	53	68	104

2) $f(x) = 3x - 5$

x	-1	0	1	2	3
$f(x)$	-8	-5	-2	1	4

3) $f(x) = 2x$

x	-2	0	2	4	6
$f(x)$	-4	0	4	8	12

4) $f(x) = x^3$

x	-2	-1	0	1	2
$f(x)$	-8	-1	0	1	8

5) $f(x) = -x + 2$

x	-5	-4	-3	-2	-1
$f(x)$	7	6	5	4	3

6) $f(x) = 3x^2 - 2x$

x	-3	-1	0	1	3
$f(x)$	33	5	0	1	21

7) $f(x) = x - 5$

x	3	6	9	12	15
$f(x)$	-2	1	4	7	10

8) $f(x) = 2x^2 + 8$

x	1	2	3	4	5
$f(x)$	10	16	26	40	58

9) $f(x) = (x-1)^3$

x	-1	0	1	2	3
$f(x)$	-8	-1	0	1	8

10) $f(x) = 5x - 8$

x	-7	-6	-5	-4	-3
$f(x)$	-43	-38	-33	-28	-23

11) $f(x) = x^3 - 1$

x	-4	-2	0	2	4
$f(x)$	-65	-9	-1	7	63

12) $f(x) = 7x^2 - 3$

x	-1	0	1	2	3
$f(x)$	4	-3	4	25	60

Name: _____

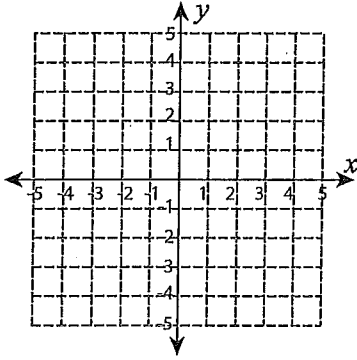
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Graphing Linear Function

Compute the function table. Draw the graph of each function.

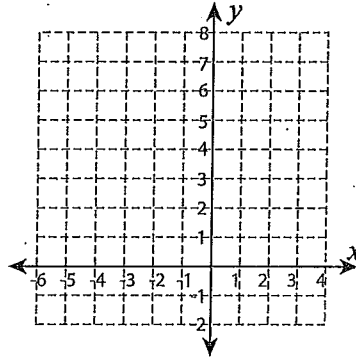
1) $f(x) = 2x + 1$

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



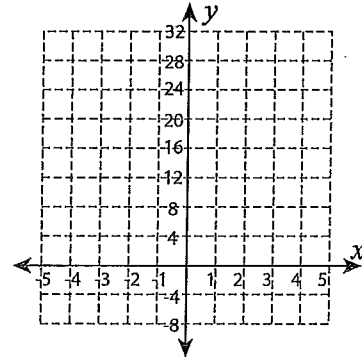
2) $f(x) = x + 5$

x	-6	-5	-3	1	3
$f(x)$					



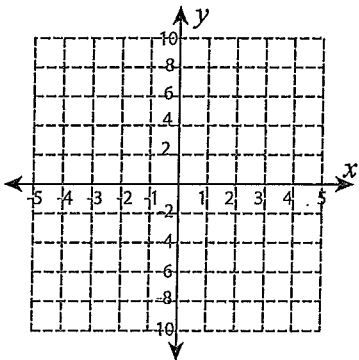
3) $f(x) = 4 - 8x$

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



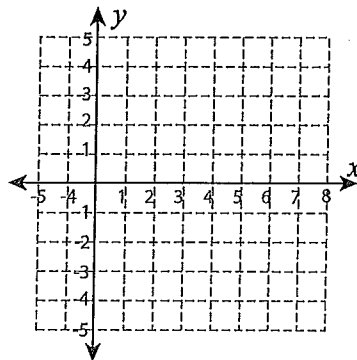
4) $f(x) = 2x$

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



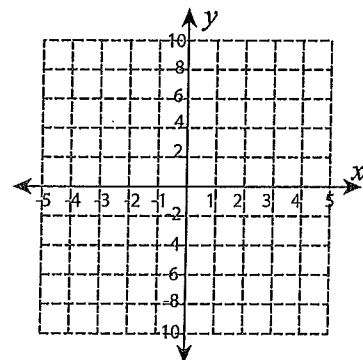
5) $f(x) = x - 9$

x	4	5	6	7	8
$f(x)$					



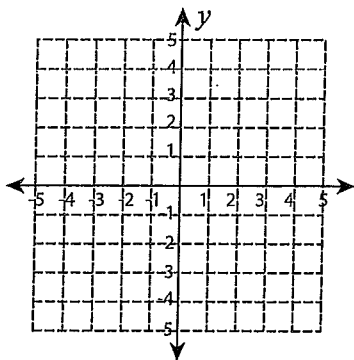
6) $f(x) = 2x + 4$

x	-4	-2	-1	2	3
$f(x)$					



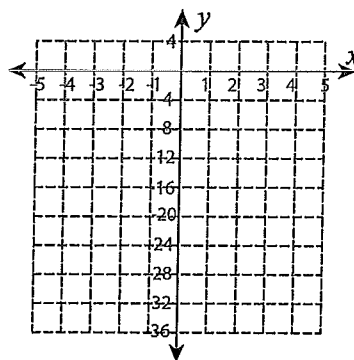
7) $f(x) = -4 - x$

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



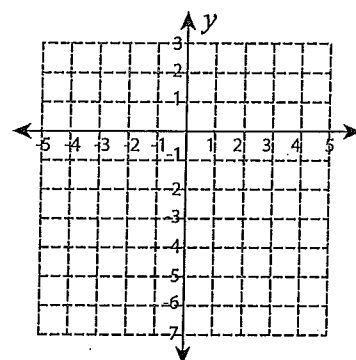
8) $f(x) = 4x - 12$

x	-5	-3	0	1	2
$f(x)$					



9) $f(x) = -x - 2$

x	-3	-1	1	3	5
$f(x)$					



Name: _____

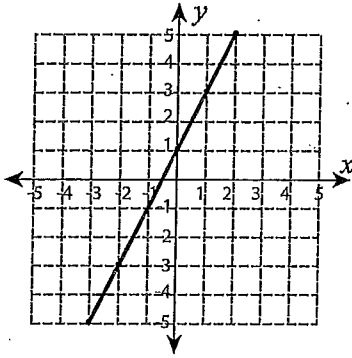
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Answer Key

Compute the function table. Draw the graph of each function.

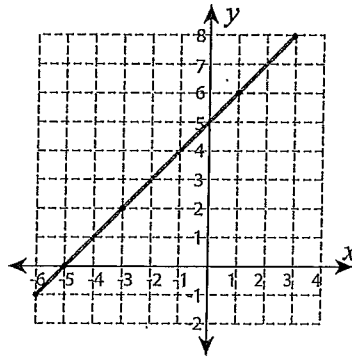
1) $f(x) = 2x + 1$

x	-3	-2	0	1	2
$f(x)$	-5	-3	1	3	5



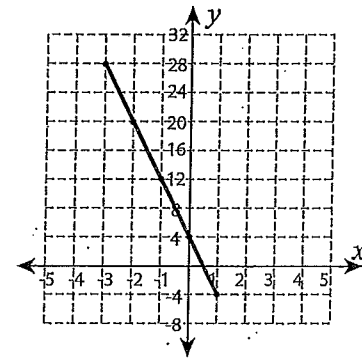
2) $f(x) = x + 5$

x	-6	-5	-3	1	3
$f(x)$	-1	0	2	6	8



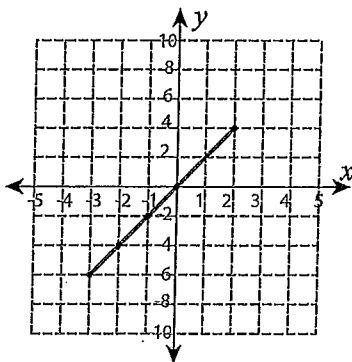
3) $f(x) = 4 - 8x$

x	-3	-2	-1	0	1
$f(x)$	28	20	12	4	-4



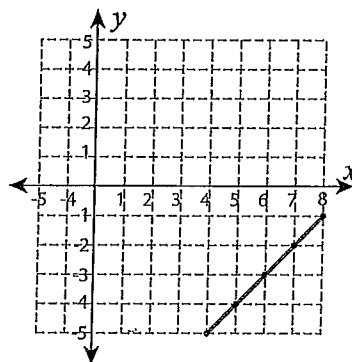
4) $f(x) = 2x$

x	-3	-2	-1	0	2
$f(x)$	-6	-4	-2	0	4



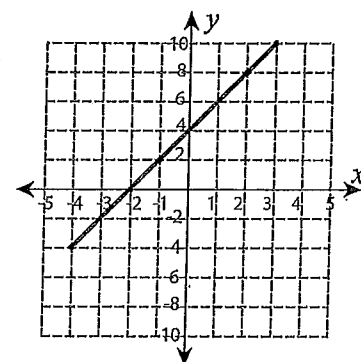
5) $f(x) = x - 9$

x	4	5	6	7	8
$f(x)$	-5	-4	-3	-2	-1



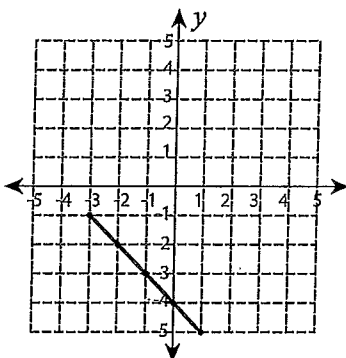
6) $f(x) = 2x + 4$

x	-4	-2	-1	2	3
$f(x)$	-4	0	2	8	10



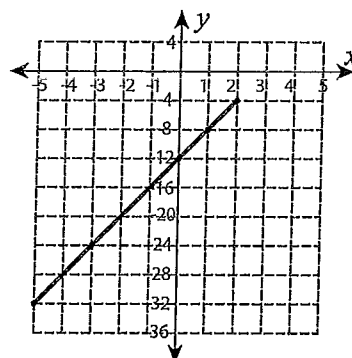
7) $f(x) = -4 - x$

x	-3	-2	-1	0	1
$f(x)$	-1	-2	-3	-4	-5



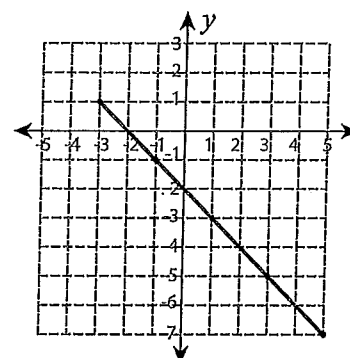
8) $f(x) = 4x - 12$

x	-5	-3	0	1	2
$f(x)$	-32	-24	-12	-8	-4



9) $f(x) = -x - 2$

x	-3	-1	1	3	5
$f(x)$	1	-1	-3	-5	-7



Name : _____

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Teacher : _____

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Complete the function table for each equation.

1) $y = x - 8$

x	y
0	-8
9	1
3	-5
7	-1
8	0

Plug in
each number
for x to get
y

5) $y = x + 8$

x	y
7	
5	
8	
2	
3	

9) $y = x - 7$

x	y
3	
5	
2	
9	
6	

2) $y = x + 7$

x	y
0	
2	
1	
9	
5	

6) $y = x + 3$

x	y
7	
1	
9	
5	
2	

10) $y = x - 4$

x	y
9	
4	
6	
0	
2	

3) $y = x - 2$

x	y
2	
3	
9	
8	
5	

7) $y = x - 9$

x	y
8	
9	
7	
3	
6	

11) $y = x + 9$

x	y
0	
3	
9	
6	
2	

4) $y = x - 6$

x	y
6	
4	
0	
7	
8	

8) $y = x + 2$

x	y
0	
2	
4	
6	
5	

12) $y = x - 5$

x	y
0	
1	
6	
8	
3	



Name : _____

Score : _____

Teacher : _____

Date : _____

Complete the function table for each equation.

1) $y = x - 8$

x	y
0	-8
9	1
3	-5
7	-1
8	0

5) $y = x + 8$

x	y
7	15
5	13
8	16
2	10
3	11

9) $y = x - 7$

x	y
3	-4
5	-2
2	-5
9	2
6	-1

2) $y = x + 7$

x	y
0	7
2	9
1	8
9	16
5	12

6) $y = x + 3$

x	y
7	10
1	4
9	12
5	8
2	5

10) $y = x - 4$

x	y
9	5
4	0
6	2
0	-4
2	-2

3) $y = x - 2$

x	y
2	0
3	1
9	7
8	6
5	3

7) $y = x - 9$

x	y
8	-1
9	0
7	-2
3	-6
6	-3

11) $y = x + 9$

x	y
0	9
3	12
9	18
6	15
2	11

4) $y = x - 6$

x	y
6	0
4	-2
0	-6
7	1
8	2

8) $y = x + 2$

x	y
0	2
2	4
4	6
6	8
5	7

12) $y = x - 5$

x	y
0	-5
1	-4
6	1
8	3
3	-2



Name : _____

Score : _____

Teacher : _____

Date : _____

Find the Slope and Y-intercept for Each Equation

1) $y = \frac{5}{2}x - 4$

slope = $\frac{5}{2}$

y-intercept = -4

Handwritten annotations: "slope" with an arrow pointing to the coefficient $\frac{5}{2}$, and "y-intercept" with an arrow pointing to the constant -4 .

2) $y = \frac{7}{4}x - 3$

slope = _____

y-intercept = _____

3) $y = -\frac{7}{6}x + 10$

slope = _____

y-intercept = _____

4) $y = \frac{7}{3}x + 5$

slope = _____

y-intercept = _____

5) $y = -\frac{2}{3}x - 2$

slope = _____

y-intercept = _____

6) $y = \frac{1}{4}x - 2$

slope = _____

y-intercept = _____

7) $y = -2x + 2$

slope = _____

y-intercept = _____

8) $y = \frac{1}{5}x + 5$

slope = _____

y-intercept = _____

9) $y = \frac{1}{2}x + 3$

slope = _____

y-intercept = _____

10) $y = -4x + 4$

slope = _____

y-intercept = _____



Name : _____

Score : _____

Teacher : _____

Date : _____

Find the Slope and Y-intercept for Each Equation

1) $y = \frac{5}{2}x - 4$ slope = $\frac{5}{2}$
y-intercept = -4

2) $y = \frac{7}{4}x - 3$ slope = $\frac{7}{4}$
y-intercept = -3

3) $y = -\frac{7}{6}x + 10$ slope = $-\frac{7}{6}$
y-intercept = 10

4) $y = \frac{7}{3}x + 5$ slope = $\frac{7}{3}$
y-intercept = 5

5) $y = -\frac{2}{3}x - 2$ slope = $-\frac{2}{3}$
y-intercept = -2

6) $y = \frac{1}{4}x - 2$ slope = $\frac{1}{4}$
y-intercept = -2

7) $y = -2x + 2$ slope = -2
y-intercept = 2

8) $y = \frac{1}{5}x + 5$ slope = $\frac{1}{5}$
y-intercept = 5

9) $y = \frac{1}{2}x + 3$ slope = $\frac{1}{2}$
y-intercept = 3

10) $y = -4x + 4$ slope = -4
y-intercept = 4



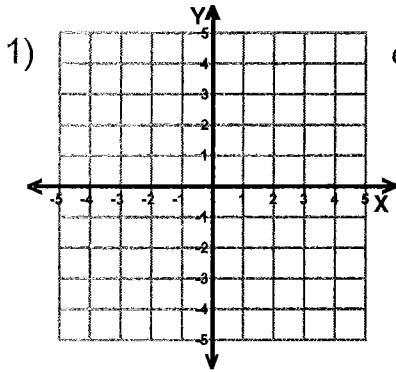
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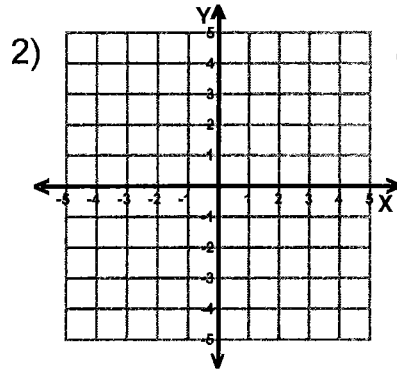
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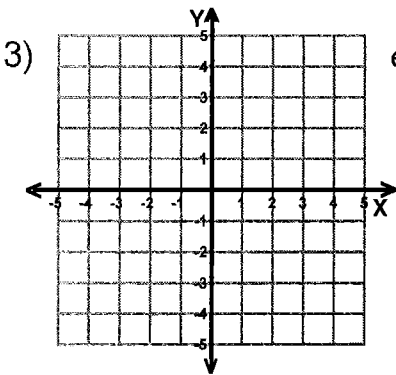
Sketch Each Line



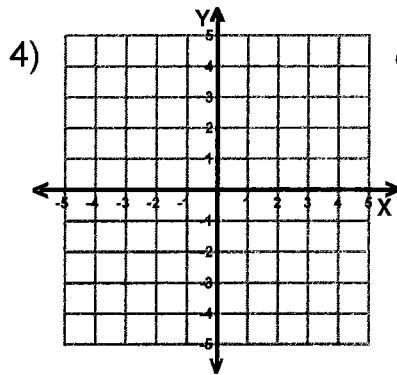
equation $y = 2x - 2$



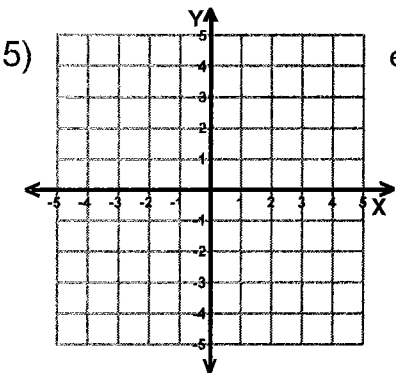
equation $y = -\frac{2}{3}x - 2$



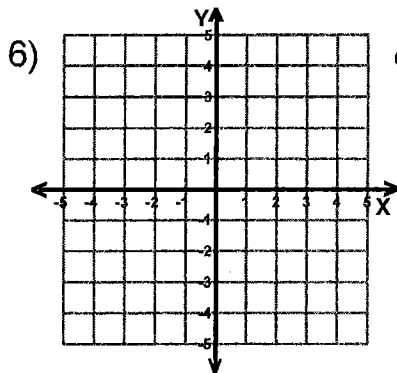
equation $y = \frac{1}{3}x + 3$



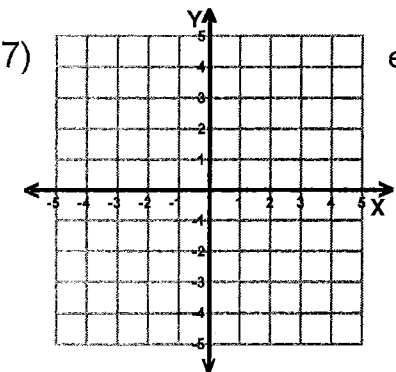
equation $y = \frac{8}{3}x - 5$



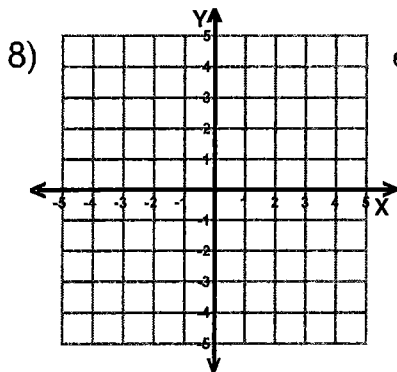
equation $y = -\frac{3}{4}x + 4$



equation $y = \frac{2}{3}x + 1$



equation $y = -\frac{7}{5}x - 3$



equation $y = -\frac{4}{3}x - 1$



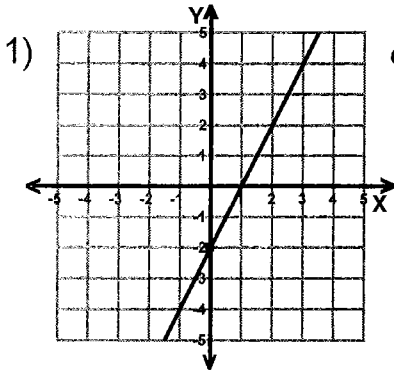
Name : _____

Score : _____

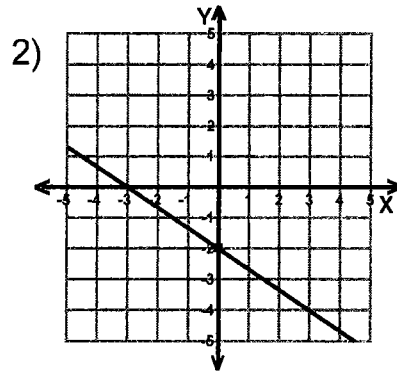
Teacher : _____

Date : _____

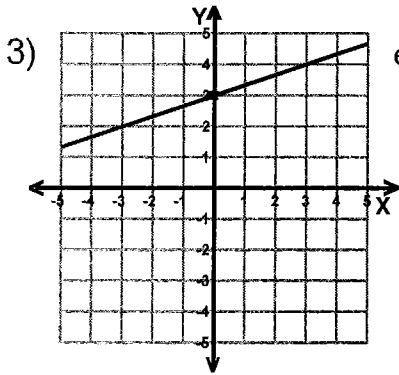
Sketch Each Line



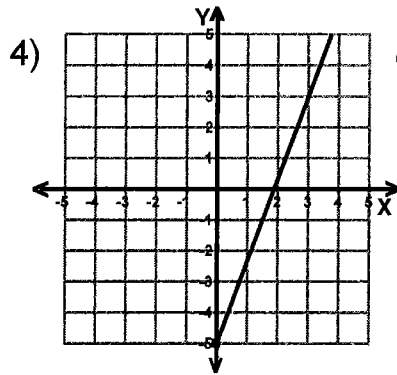
equation $y = 2x - 2$



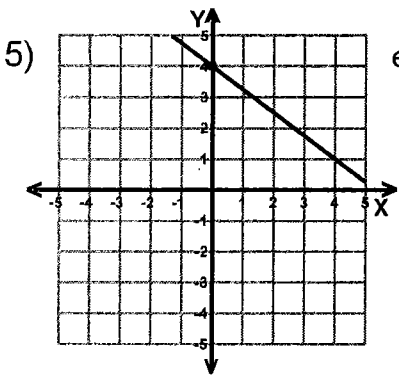
equation $y = -\frac{2}{3}x - 2$



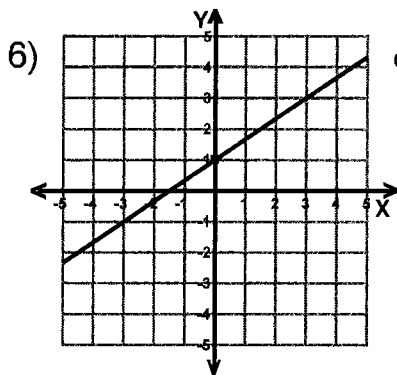
equation $y = \frac{1}{3}x + 3$



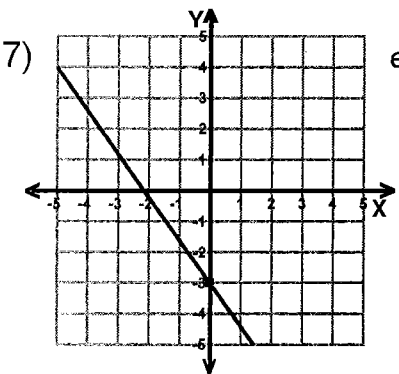
equation $y = \frac{8}{3}x - 5$



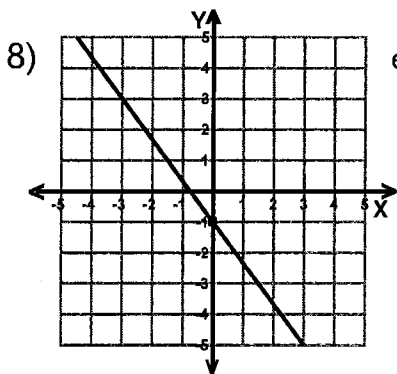
equation $y = -\frac{3}{4}x + 4$



equation $y = \frac{2}{3}x + 1$



equation $y = -\frac{7}{5}x - 3$



equation $y = -\frac{4}{3}x - 1$

