Algebra 2

0-01 Solve Linear Equations and Inequalities

Golden Rule
Do unto others as you would _____them to do unto _____. —Jesus

Golden Rule of Algebra
Do unto one side of the equation as you _____done unto the _____.

General way to solve linear equations
1. Get the _____all on one _____
2. Get everything _____from the _____

Solve $3x + 6 = 0$ Solve $2(x + 1) = 5x$

Solve $4(x + 5) \geq 16$ Solve $-2x + 5 < 17 - x$

Solve for y: $2x + 5y = 12$ Solve for h: $3rh + 5h = 7$

A real estate agent's base salary is $22,000 per year. The agent earns a 4% commission on total sales. How much must the agent sell to earn $60,000 in one year?

Algebra 2

0-02 Use Problem Solving Strategies and Models

....

Common formulas

Distance/Rate	$d = rt$
Temperature	$F = \frac{9}{5}C + 32$
Area of a Triangle	$A = \frac{1}{2}bh$
Area of a Rectangle	$A = \ell w$

Perimeter of a Rectangle	$P = 2\ell + 2w$
Area of a Trapezoid	$A = \frac{1}{2}(b_1 + b_2)h$
Area of a Circle	$A = \pi r^2$
Circumference of a Circle	$C = 2\pi r$

- Easiest to start by writing an equation in _____. This is called a _____.

Ways to find a verbal model

- Use a _____
- Look for a _____
- Draw a _____

An arctic tern flies an average speed of 16.7 miles per hour. How long will it take to fly from its winter grounds in Antarctica to its breeding grounds in Greenland, a distance of 12000 miles?

The table shows the height h of a paramotorist after t minutes. Find the height of the paramotorist after 8 minutes.

Time (min), t	0	1	2	3	4
Height (ft), h	2400	2190	1980	1770	1560

A bear walks 10 miles towards the west. Then it turns around and walks back east for 2 miles to try to catch a fish. After lunch it walks 5 more miles west until it finds a place to sleep. How far is the bear's sleeping location from its starting position?

Algebra 2

0-03 Solve Absolute Value Equations and Inequalities

....

Absolute Values

- _____from origin to coordinate
- In one dimension, turns the number _____
- $| x | = b$
  - Distance between _____ is b
- $| x - k | = b$
  - Distance between _____ is b

Steps to Solve Absolute Value Equations

1. Write _____ equations.
   a. One with the absolute value expression _____.
   b. One with the absolute value expression _____.
2. _____each equation.
3. _____your solutions.

Solve $|x - 3| = 10$ $|2x + 5| = 3x$

$|4x - 1| = 2x + 9$

Absolution Value Inequalities

- Solve absolute value inequalities the same as _____
- Exception: write answer as _____

Solve $|2x - 7| > 1$ $|7 - x| \leq 4$

- In manufacturing, _____is the amount of allowed _____between the _____ measurement and the _____.

$$|Actual - Standard| \leq Tolerance$$

Ostrich eggs have an average mass of 1950 grams, with a tolerance of 350 grams. Write and solve an absolute value inequality that describes the mass of ostrich eggs.

Algebra 2

0-04 Find Slope and Write Equations of Lines

Slope

$$Slope = \frac{\rule{2cm}{0.4pt}}{\rule{2cm}{0.4pt}}$$

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

Slope is the _____
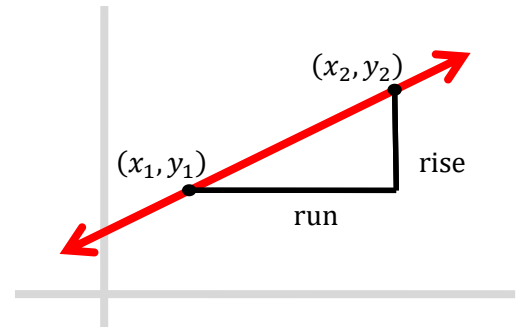
Types of Slope

- Positive Slope: _____
- Zero Slope: _____
- Negative Slope: _____
- No Slope (Undefined): _____
  There's **No Slope** to stand on.

Find the slope of the line passing through the given points. Classify as *rises*, *falls*, *horizontal*, or *vertical*.

$(7, 3), (-1, 7)$ $(7, 1), (7, -1)$

Parallel Lines

- In the same plane and do not _____
- Go the _____direction
- Slopes are the _____
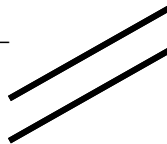
Perpendicular Lines

- Intersect to form a _____angle
- Slopes are _____
- OR Product of slopes is _____
- $\frac{2}{3}$ and $-\frac{3}{2}$
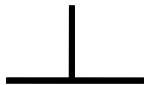
Tell whether the lines are *parallel*, *perpendicular*, or *neither*.

Line 1: through $(-2, 8)$ and $(2, -4)$

Line 2: through $(-5, 1)$ and $(-2, 2)$

Writing Equations of Lines

- Given _____ and _____
1. Use slope-intercept form _____
- Any other line
1. Find the _____(m)
2. Find a _____ the line goes through (x_1, y_1)
3. Use point-slope form _____

Write the equation of the line that passes through (−1, 6) and has a slope of 4.

Write the equation of the line that passes through (−1, 2) and (10, 0)

In a chemistry experiment, you record the temperature to be −5 °F one minute after you begin. Six minutes after you begin the temperature is 20 °F. Write a linear equation to model this.

Algebra 2

0-05 Graph Equations of Lines

....

▋ The simplest way to graph

Make a _____

1. Choose a reasonable range of _____usually including _____.
2. Substitute each *x* value into the _____to find the corresponding _____.
3. _____the points on a coordinate plane.
4. Draw the _____through the points.

Graph $y = x^2 - 3$
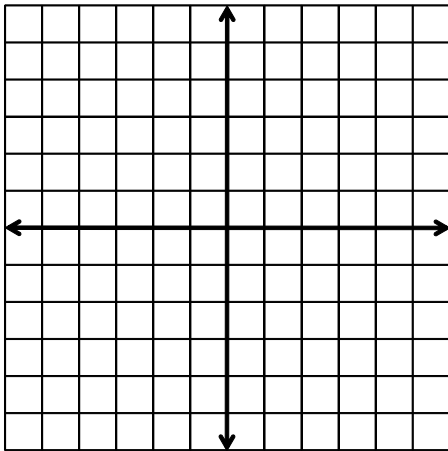
Slope-intercept form

$$y = mx + b$$

- *m* is _____; *b* is _____

▋ To graph

1. Solve equation for _____
2. Plot the _____
3. From there move up and over the _____ to find another _____of points
4. Draw a _____neatly through the points

Graph $y = -2x$

$y = x - 3$

$f(x) = 2 - x$
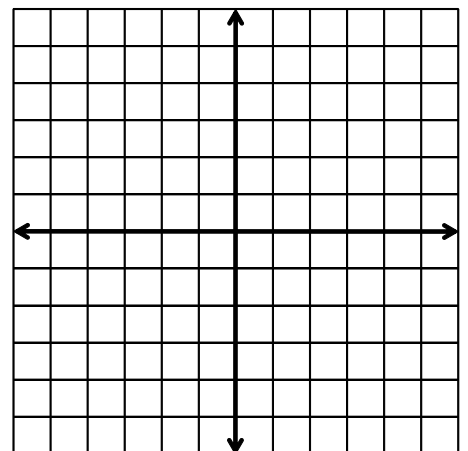
Standard Form

$$Ax + By = C$$

- A, B, and C are _____

To graph

1. Find the _____ and _____by letting the other variable _____
    - *x*-intercept:

        _____

        _____

        _____

    - *y*-intercept:

        _____

        _____

        _____

2. Plot the _____ points
3. Draw a _____ through the two points

Horizontal Lines

_____

Vertical Lines

_____

Graph $2x + 5y = 10$

$x = 1$

$y = -4$
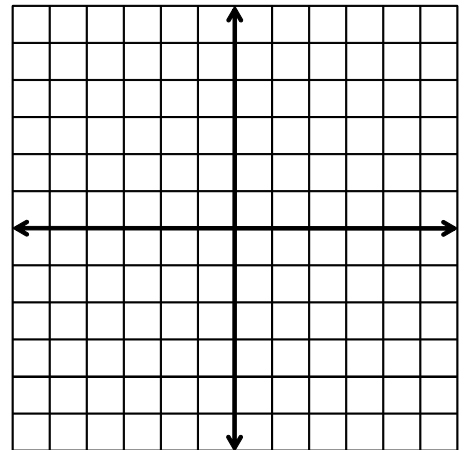
Algebra 2

0-06 Graph Absolute Value Functions and Transformations

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Transformations

- Changes to graph's _____, _____, _____, or _____

$$f(x) = a \cdot f(x - h) + k$$

- Stretch/Shrink
  - _____ is the factor the graph is stretched or shrunk _____
  - _____ the *y*-coordinates by *a*
- Reflection → _____ the graph over a _____
  - If *a* is _____, the graph will be flipped over the _____
- Translation → _____graph
  - *h* is how far graph moves to _____
  - *k* is how far graph moves _____
- Apply stretch/shrinks and reflections _____translations

The graph of *f*(*x*) is given. Sketch the following functions:
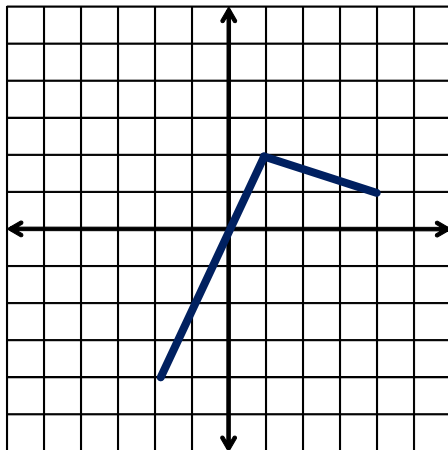
$y = -\frac{1}{2}f(x)$ $y = f(x - 1) + 3$
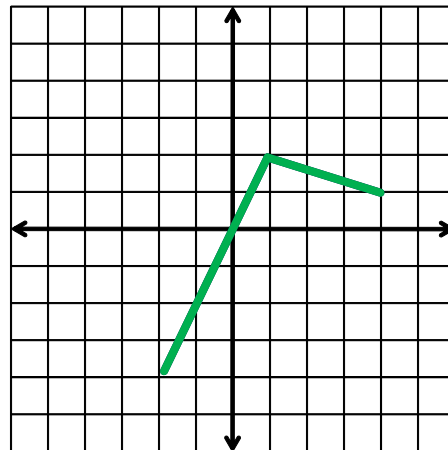
Absolute Value Function

$$f(x) = a|x - \text{h}| + k$$

To graph an absolute value graph,

1. Make a _____of values,

OR

2. plot the _____(h, k)
3. follow the _____of *a* on the _____ and −*a* on the _____.

Slope of left is −1

Vertex

Slope of right is 1
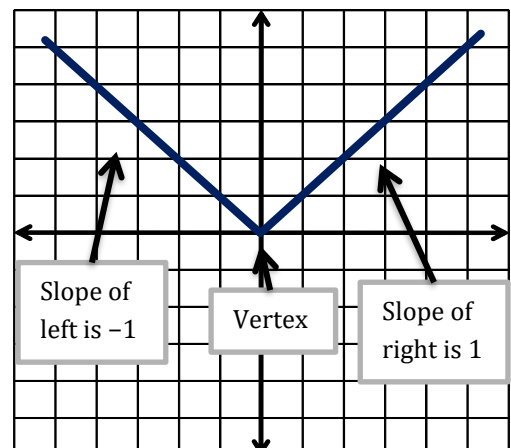
Graph and compare with $y = |x|$
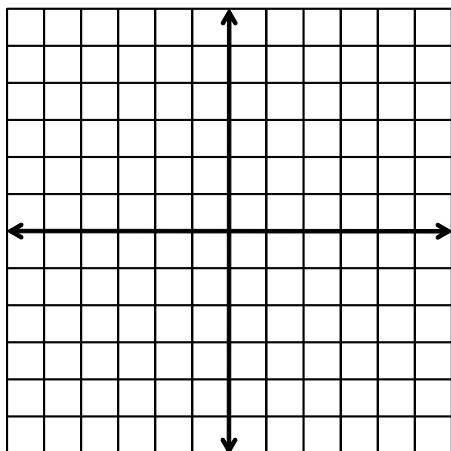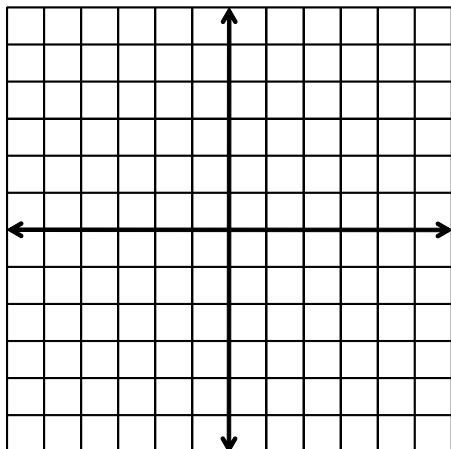
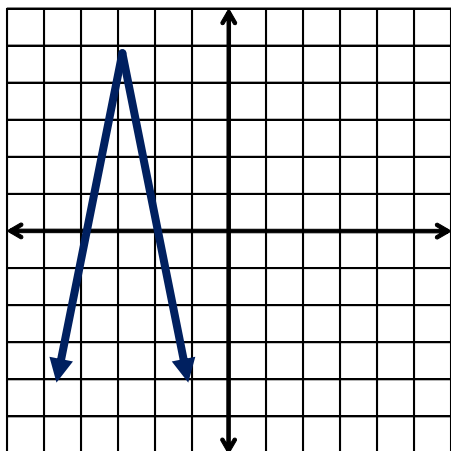$y = |x - 2| + 3$ $y = \frac{1}{4}|x|$
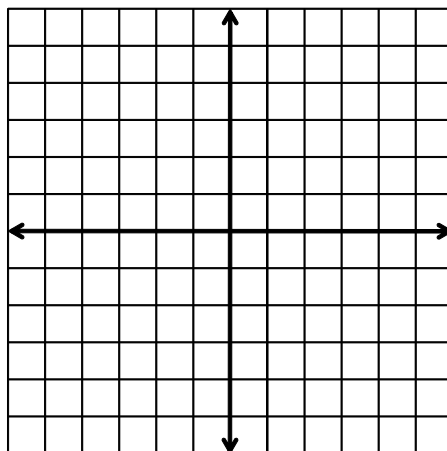
Graph and compare with $y = |x|$

$y = -3|x + 1| - 2$

Write an absolute value equation for the given graph.

Algebra 2

0-07 Graph Linear Inequalities

....

Linear Inequality in two variables

- Like linear _____, but with _____instead of =

Tell whether the given ordered pair is a solution of $5x - 2y \leq 6$

$(0, -4)$ $(-3, 8)$

Graphing a linear inequality

1. Graph the line as if it was _____
2. Dotted or Solid line
   - Dotted if _____
   - Solid if _____
3. _____
   - Test a point _____on the line
   - If the point is a solution, shade _____ of the line
   - If the point is not a solution, shade _____ of the line
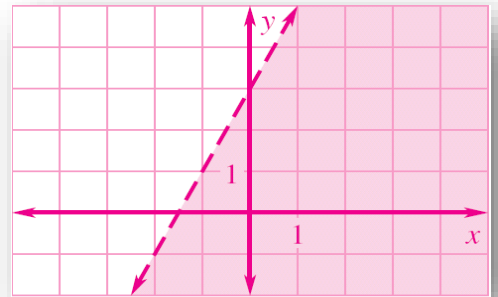
Graph $x \geq -4$ $y > -3x$
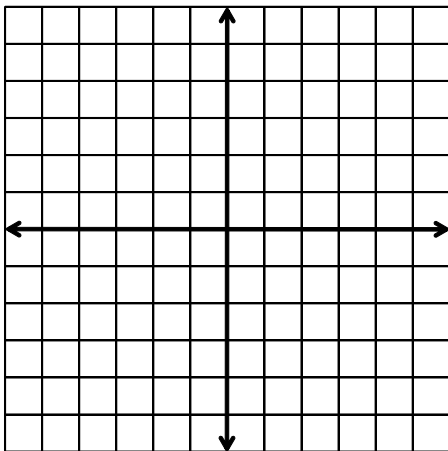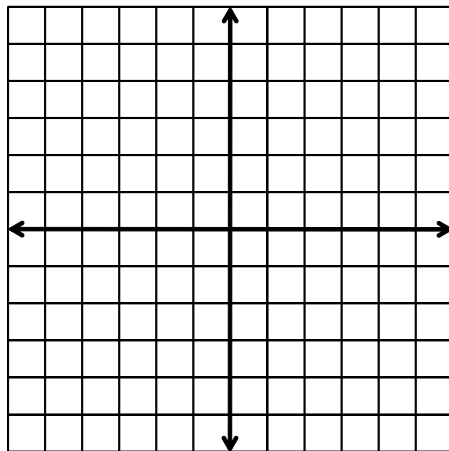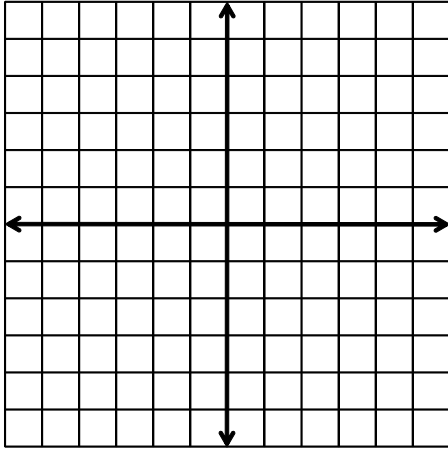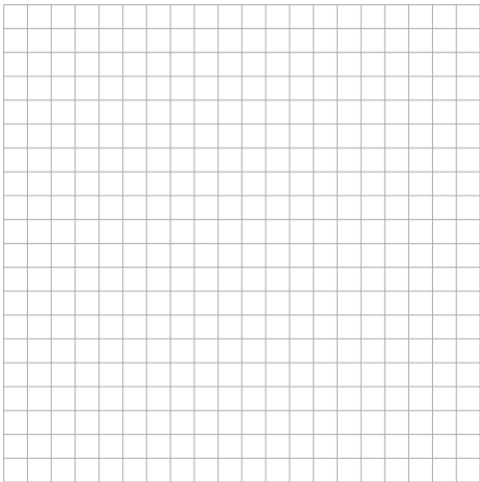
Graph $y \le 2x + 3$ $y < 3|x - 1| - 3$
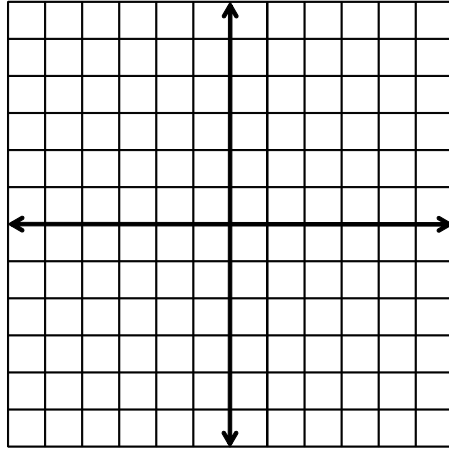
You have two part-time summer jobs, one that pays $9 an hour and another that pays $12 an hour. You would like to earn at least $240 a week. Write an inequality describing the possible amounts of time you can schedule at both jobs.
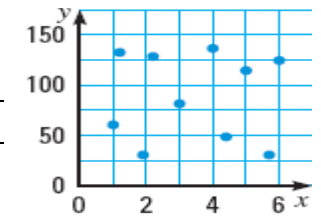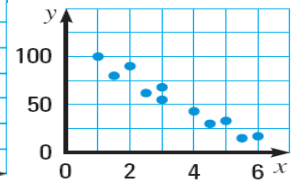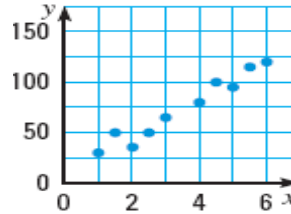
Graph the previous answer

Identify three possible solutions of the inequality

Algebra 2

0-08 Draw Scatter Plots and Best-Fitting Lines

Scatter Plot

- Graph of many _____
- Positive Correlation
  - The _____of the scatter plot tends to be _____
- Negative Correlation
  - The _____of the scatter plot tends to be _____
- No Correlation
  - There is _____ obvious _____from the scatter plot

Correlation Coefficient (r)

- Number between _____ and _____ that measures how well the data fits a _____.
- Positive for _____correlation, negative for _____
- $r = 0$ means there is _____ correlation

For each scatter plot, (a) tell whether the data have a positive correlation, a negative correlation, or approximately no correlation, and (b) tell whether the correlation coefficient is closest to –1, –0.5, 0, 0.5, or 1.
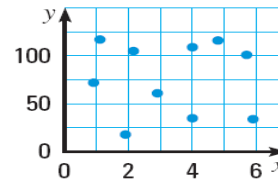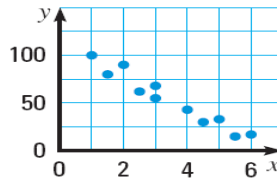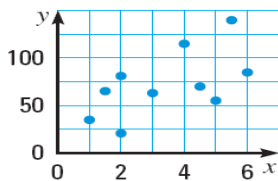
Best-fitting line

- Line that most closely _____the _____

Find the best-fitting line

1. Draw a _____ of the data
2. Sketch the _____that appears to follow the data the closest
   - There should be about as many points below the line as above
3. Choose _____points on the line and find the equation of the line
   - These do _____have to be original data points

Monarch Butterflies: The table shows the area in Mexico used by Monarch Butterflies to spend winter, *y*, in acres *x* years after 2006.

| x	0	1	2	3	4	5	6	7
y	16.5	11.4	12.5	4.7	9.9	7.1	2.9	1.7

Approximate the best-fitting line for the data.

Use your equation from part (a) to predict the area used by the butterflies in 2016.
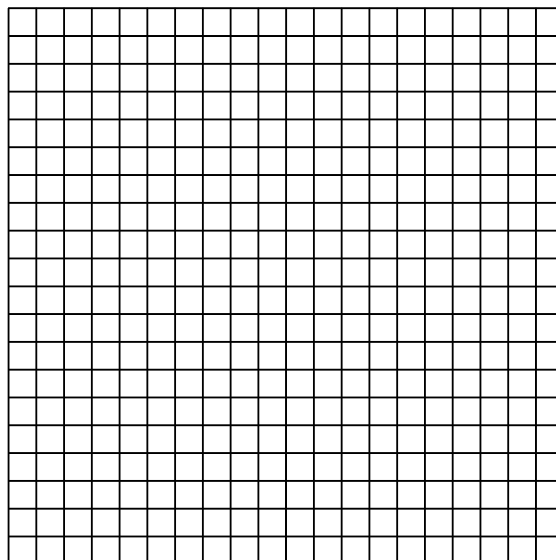
Finding Linear Regression on a TI-84

1. Push STAT and select Edit….
2. Enter the *x*-values in List 1 (L1) and the *y*-values in List 2 (L2).
3. To see the graph of the points
   a. Push Y= and clear any equations.
   b. While still in Y=, go up and highlight Plot1 and press ENTER.
   c. Press ZOOM and select ZoomStat.
4. Push STAT and move over to the CALC menu.
5. Select LinReg(ax+b) (Linear Regression).
6. Make sure the Xlist: is L1,the Ylist: is L1, the FreqList: is blank, and the Store RegEQ: is Y1.
   a. Get Y1 by pressing VARS and select Y-VARS menu.
   b. Select Function….
   c. Select Y1.
7. Press Calculate
8. The calculator will display the equation. To see the graph of the points and line, press GRAPH.
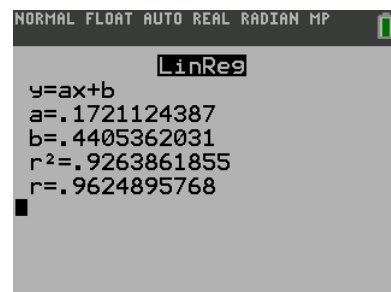
Finding Linear Regression on a NumWorks graphing calculator

1. On the home screen select Regression.
2. In the Data tab, enter the points.
3. Move to the Graph tab.
4. The default is a linear regression and is displayed at the bottom of the screen. To change the regression type
   a. Press OK.
   b. Select Regression.
   c. Select the desired regression type
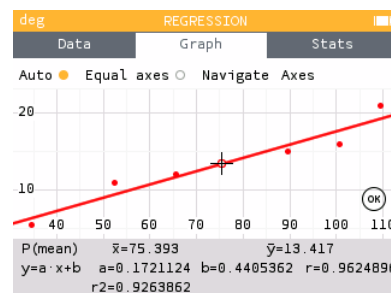
Algebra 2

0-Review

Take this test as you would take a test in class. When you are finished, check your work against the answers.

0-01

1. Solve $2x + 1 = 5x - 3$
2. Solve $2 < 2x + 1 < 5$
3. Solve for y: $3x + 5y = 8$

0-02

4. On Sabbath, Franklin's family likes to walk in the woods. If Franklin walks at a rate of 3.5 mph, how far can he walk in 2 hours?

5. A honey bee is collecting pollen from flowers. The table shows how many flowers, f, it has visited in t minutes. If the pattern continues, how many flowers will the bee visit in 8 minutes?

t (min)	1	2	3	4
f (flowers)	6	12	18	24

0-03

6. Solve $|2x + 1| = 7$
7. Solve $2|x - 6| = 10$
8. Solve $|7x - 1| < 15$

0-04

9. Find the slope of the line through (−2, 1) and (−5, 5).
10. Write the equation of the line with slope = 5 and passes through (7, 1).
11. Write the equation of the line that passes through (0, 7) and (3, −2).

0-05

12. Graph $y = \frac{2}{3}x - 2$
13. Graph $y = -3x$.
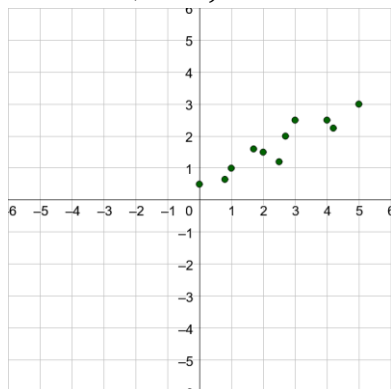14. Graph $3x - 4y = -12$.

0-06

15. Describe the transformation. $\frac{1}{3}f(x - 2) + 4$
16. Graph $y = |x - 2| - 3$.

0-07

17. Graph $y > x$.
18. Graph $y \le \frac{1}{2}|x + 1| + 2$.

0-08

19. For each scatter plot, a) tell whether the data have a *positive correlation*, a *negative correlation*, or approximately *no correlation*, and b) tell whether the correlation coefficient is closest to −1, −0.5, 0, 0.5, or 1.
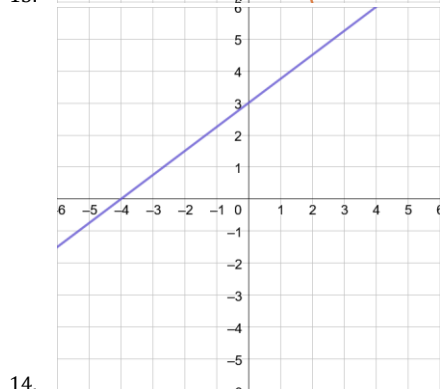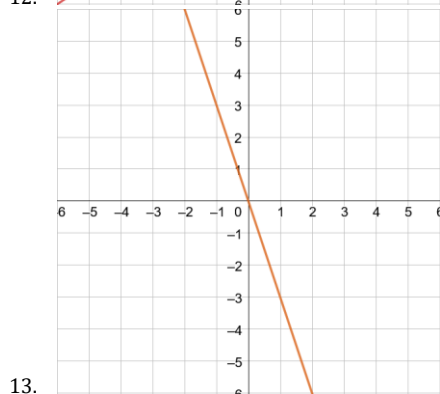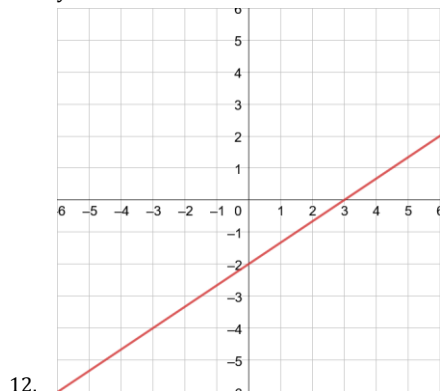

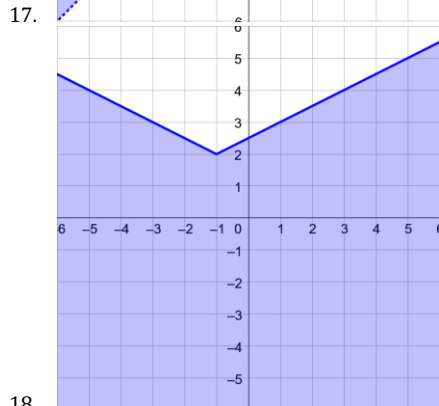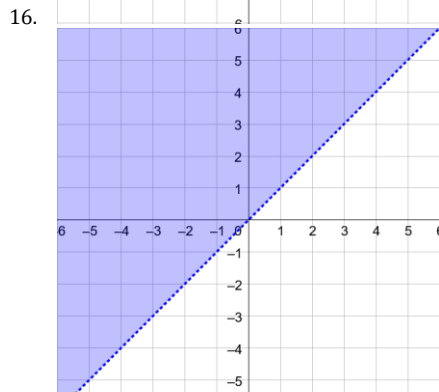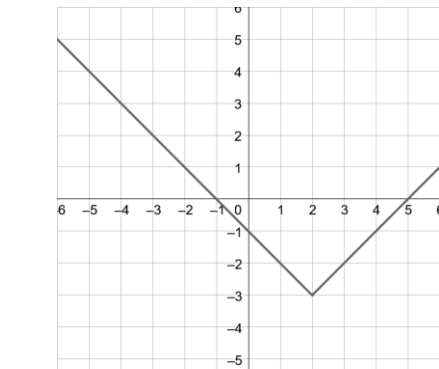20. Draw a scatter plot using the data in the table, then write the equation of the best-fitting line.

x	0	0.5	1	1.5	2	2.5	3	3.5	4
y	5	4.75	4.5	4.25	4	3.75	3.5	3.25	3

Answers

1. $x = \frac{4}{3}$
2. $\frac{1}{2} < x < 2$
3. $y = -\frac{3}{5}x + \frac{8}{5}$
4.   7 miles
5.   48 flowers
6. $x = -4, 3$
7. $x = 1, 11$
8. $-2 < x < \frac{16}{7}$
9. $m = -\frac{4}{3}$
10. $y = 5x - 34$
11. $y = -3x + 7$

12.

13.

14.

15. Vertical shrink by factor of $\frac{1}{3}$, move 2 right and 4 up

16.

17.

18.

19. Positive correlation, r ≈ 0.5

20.

$y = -0.5x + 5$