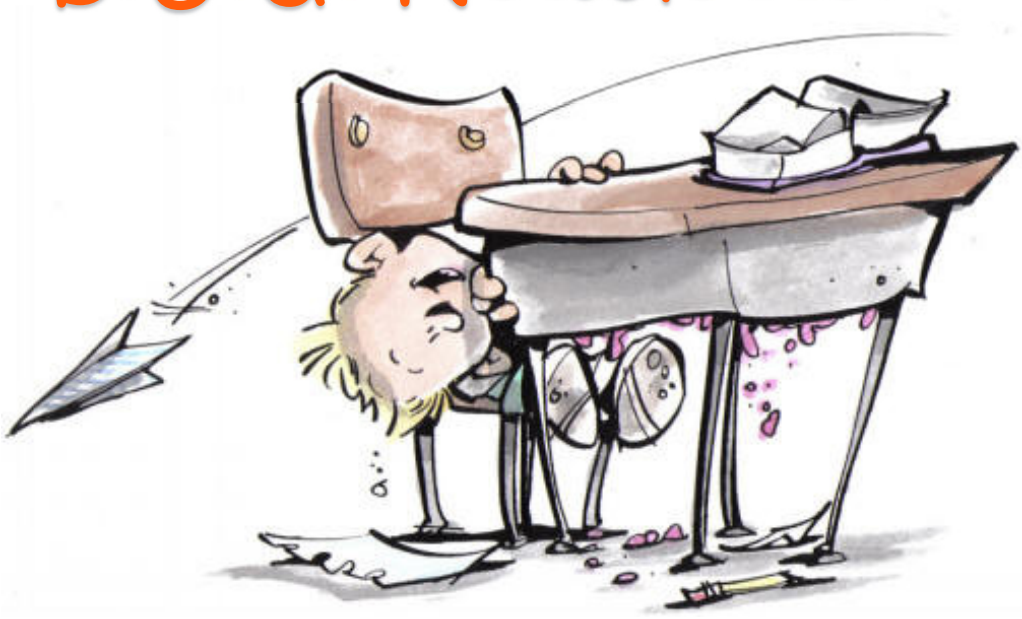
B.U.G. Newsletter



November 2014

THIS NEWSLETTER IS A SERVICE THAT WAS FUNDED BY "NO CHILD LEFT BEHIND" TITLE II PART A HIGHER EDUCATION IMPROVING TEACHER QUALITY HIGHER EDUCATION GRANT ADMINISTERED THROUGH THE UNIVERSITY OF GEORGIA.

IN THIS ISSUE

Turkey Day is around the corner!

by Jennifer L. Brown

Thanksgiving is just around the corner. I hope that your first semester has been productive and enjoyable. We are approaching the end of the semester so this month's activities are part of Unit 3. If you need to refer to the Prior Knowledge and Common Misconceptions for Unit 3, please see the October 2014 Newsletter, which is posted on my website. In this newsletter, I am focusing on rate of change for Coordinate Algebra, dilation and pi in Analytic Geometry, and polynomial, rational, and radicals in Advanced Algebra.

With all students, freshmen through seniors, slope (or rate of change) is a difficult concept. I assume it relates back to the idea of abstract versus concrete. In Coordinate Algebra, this rate of change activity shows a real life application of slope to a t-shirt company. In Analytic Geometry, I included my Pi Line Activity, which I located though the National Council of Teachers of Mathematics. When I implemented this activity in my classroom, I had a local cabinetmaker make concentric circles for me, but you can use everyday household items. I would suggest marking the center so the students can measure the diameter accurately. The activity shows the students that pi is a ratio or constant rate of change between the circumference and diameter. It is a great way to review those Coordinate Algebra concepts. The accompanying PowerPoint is posted on my website, and the Geometry Sketchpad file on my website shows the dilation of the circle. It is entitled "Relationship with Circumference and Diameter". In Advanced Algebra, I provided a station review activity for polynomials, rationals, and radicals for Units 2 and 3. My students loved these station reviews. I would tape the various stations around the room. The students usually moved in pairs to each station. They were able to practice the concepts, and it allowed them to move, talk, and walk. High school students get tired of sitting in a desk all day. ☺ For this activity, "Buddy A" completes the odd numbers, and "Buddy B" completes the even numbers. Once finished, the buddies check each other's work. It is a great way for the students to "teach" each other, which increases the knowledge retention. If you have any questions, please let me know.

Dr. Brown ☺

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FOR MORE IDEAS AND ACTIVITIES

Bell's Useful Guide for Teachers

www.bugforteachers.com/crmc.html

Rate of Change Activity

Objective

Students will find the slope of a line, given two points.

Materials

- Chart paper
- Graph paper
- Markers
- Rulers
- "Internet Quote" resource sheets (one per pair)
- "Finding the Slope Using Ordered Pairs" resource sheets (one per group)
- "Finding the Slope Using a Graph" resource sheets (one per student)
- Whiteboards or sheet protectors with white paper
- Dry-erase markers

Opener (10 minutes)

"Your school's chorus is planning a trip to Disney World to celebrate the end of a successful year. You have been asked to investigate the purchase of group t-shirts."

As a class, start a KWLS chart for this topic. Complete the K (know) and W (want to know) of the chart on the board or on chart paper.

Internet Quote Activity (15 minutes)

Assign students to pairs and have them examine the quote from *Kayne's T-shirts* and complete the "Internet Quote" resource sheet. Circulate and monitor the pairs in order to ensure student understanding of the concept.

Have pairs share answers to the activity in a whole class discussion. (Note: Be sure that the rate of change for this scenario is identified.)

Answers:

1. 8
2. Yes, there is a constant increase of 8 shirts.
3. 42
4. There is a constant increase of $42.
5. $\frac{42}{8}$, The cost increases by $42 for each additional 8 shirts.
6. Answers will vary.

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https://secondarymathcommoncore.wikispaces.hcpss.org/file/view/Slope+and+Linear+Functions+Day+3.doc
(MCC9-12.F.IF.4; MCC9-12.F.IF.6; MCC9-12.F.BF.1; MCC9-12.F.LE.1a; MCC9-12.F.LE.1b)

Finding Slope Activity (20 minutes)

Ask students to share what they remember about rate of change. *(Possible Answer: rise over run, slope, change in y over change in x, vertical change and horizontal change, etc.)*

Ask students how slope can be found using any two ordered pairs from the table? First, have students generate ideas in a small group, then have groups share ideas with the class. *(Possible answers: graph and find horizontal change and vertical change, find differences in y-values and x-values)*

Have groups investigate their strategy, using the table or graph paper if needed. Circulate around room to determine which groups have found the correct solution. Have these groups present solutions to the class and explain the method they used to determine the slope.

(Note: If possible have multiple groups present if they used different strategies or different sets of ordered pairs. If all groups used the same ordered pairs, once the solution is found, challenge groups to find the slope using other ordered pairs.)

Finding the Slope Using Ordered Pairs Activity (20 minutes)

Assign students to four groups. Have each group work together to complete "Finding the Slope Using Ordered Pairs" resource sheet. The teacher should call on groups to share the slope they found for one of the problems (#1 - 4). Each group should be prepared to give the slope they found for any of the problems. As a class, discuss Part 2 of "Finding the Slope Using Ordered Pairs" resource sheet.

Answers:
1. slope is 6
2. slope is 7
3. slope is 4
4. slope is 6

Part 2 answers may vary.

Finding the Slope Using a Graph Activity (20 minutes)

Ask students how they can find the slope of an equation of a line when given a graph. *(Possible answers: find two points and build a table, find the vertical and horizontal change between two points.)*

Using a transparency graph paper or graph paper under the document camera, draw a line and label some points. Call on students to come up and show their strategy for finding slope. Ask students to give thumbs up/down if they agree or disagree. Make sure students understand how to find slope given a graph.

Give each student the "Finding the Slope Using a Graph" resource sheet. Allow a few minutes for students to find the slope of each line. One at a time, have students use whiteboards to show the slope that they have found using the graphs.

Answers: a. –2 b. 2 c. $\frac{2}{3}$ d. $-\frac{1}{2}$ e. 1 f. 0

Closure (5 minutes)

As a class, complete the KWLS chart, emphasizing L (learned) and S (still want to know).

Name _____

Internet Quote

Kayne's T-shirts, an online t-shirt company, has sent you a quote for their t-shirts. The table below shows the cost for the number of shirts ordered.

Number of t-shirts	**Cost (in dollars)**
t	***c***
8	102
16	154
24	206
32	258
40	310
48	362
56	414
64	466

1. Using the table above, find the differences in the Number of t-shirts ordered.

2. Is there a pattern? If so, describe it.

3. Using the table above, find the differences in the Cost.

4. Is there a pattern? If so, describe it.

5. Write a ratio that shows the change (differences) in cost to the change (differences) in the number of t-shirts (rate of change). What does this represent?

6. Record anything you have learned or observed.

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(MCC9-12.F.IF.4; MCC9-12.F.IF.6; MCC9-12.F.BF.1; MCC9-12.F.LE.1a; MCC9-12.F.LE.1b)

Name _____

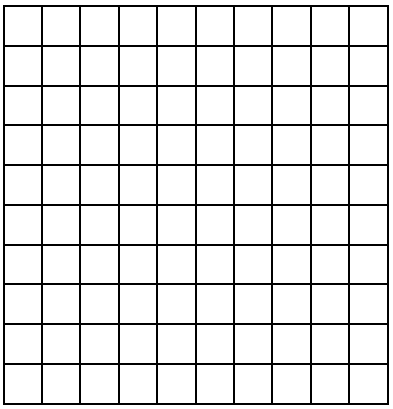
Finding the Slope Using Ordered Pairs

Part 1 For each t-shirt company:

- Plot the ordered pairs on the grid that is on the right of the table.
- Find the slope for this t-shirt company using the values in the table

1.

Number of t-shirts	**Cost (in dollars)**
x	***y***
2	87
4	99
6	111



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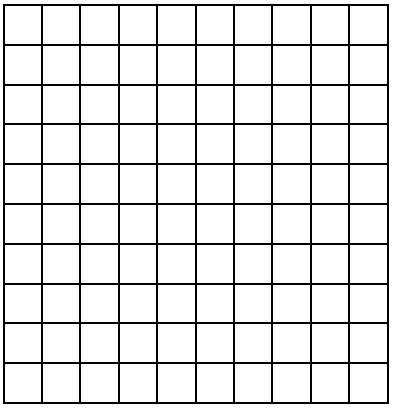
2.

Number of t-shirts	**Cost (in dollars)**
x	***y***
5	35
11	77
19	133



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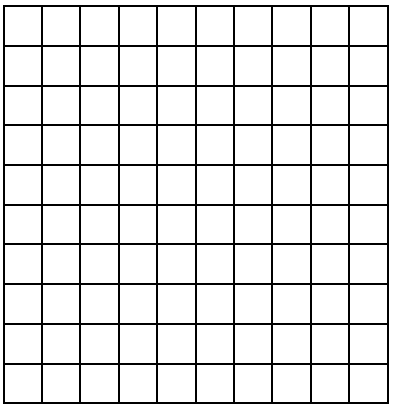
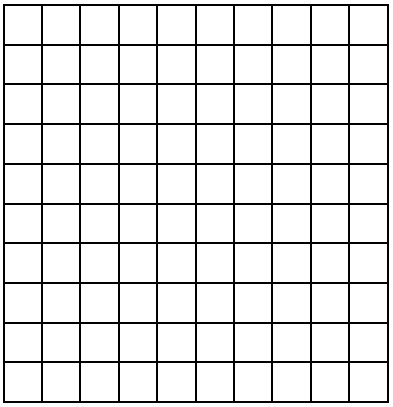
3.

x	5	10	15
y	23	43	63



4.

x	4	10	17
y	22	58	100



Part 2 Answer the following questions:

1. How did you determine the slope?

2. What did you notice about each graph?

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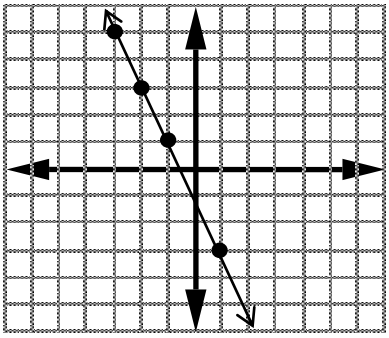
(MCC9-12.F.IF.4; MCC9-12.F.IF.6; MCC9-12.F.BF.1; MCC9-12.F.LE.1a; MCC9-12.F.LE.1b)

Name _____

Finding the Slope Using a Graph

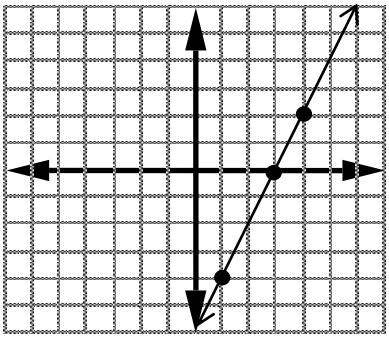
Find the slope of each from the graph:

a.



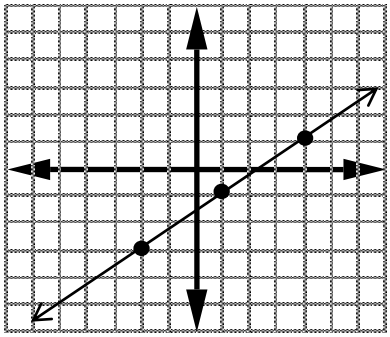
Slope: _____

b.



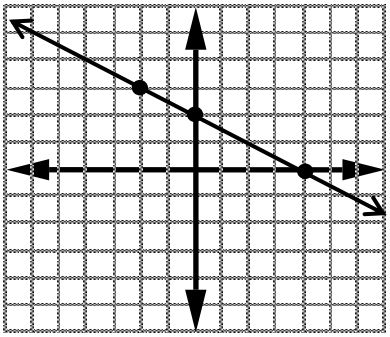
Slope: _____

c.



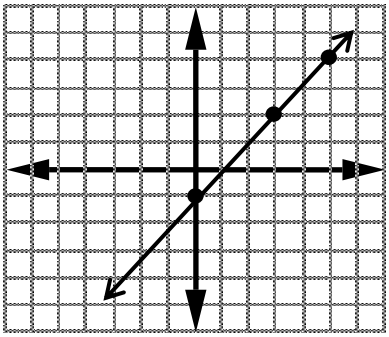
Slope: _____

d.



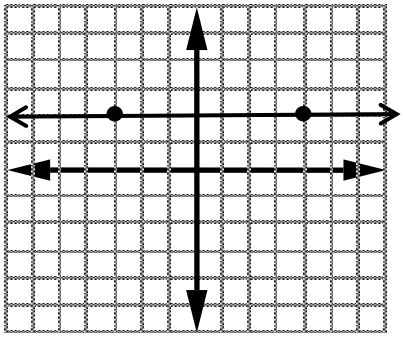
Slope: _____

e.



Slope: _____

f.



Slope: _____

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(MCC9-12.F.IF.4; MCC9-12.F.IF.6; MCC9-12.F.BF.1; MCC9-12.F.LE.1a; MCC9-12.F.LE.1b)

Slope, Pi, and Lines

NAME _____

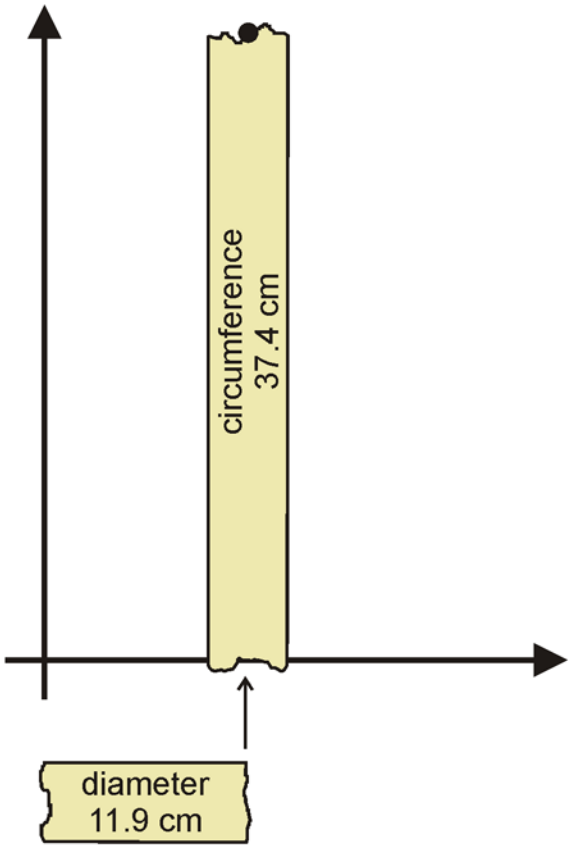
In this activity, you will measure the circumference and diameter of several circles, and then graph the relationship between circumference and diameter.

Your group should have a roll of masking tape, a pair of scissors, and at least three circular objects of various sizes.

A. Wrap masking tape around one of the circles, overlapping the edges. Select a place to cut through the masking tape, peel it off the object, and label it "circumference." Measure its length and write the measurement on the tape.

B. Stretch a length of tape from one side of the object to the other that passes through the center of the circle. Trim the tape at the edges of the circle and label this strip as "diameter." Measure its length and write the measurement on the tape.

C. On the graph, place the tape of the diameter under the *x*-axis. Then place the circumference tape vertically, so that it is parallel to the *y*-axis. Plot a point at the top of the circumference strip and label its coordinates. (See diagram below.)



(MCC9-12.G.GMD.1)

1. Repeat Steps A–C for the other circles. Record a summary of the results in the table below.

Object	Diameter	Circumference

2. Draw a straight line that approximates the points on your graph.

3. For the line in your graph, where does the *y*-intercept occur? Where *should* the *y*-intercept occur? Explain what the *y*-intercept means in terms of diameter and circumference.

4. What is the approximate slope of the line on your graph?

5. What does the slope of your line represent? What two quantities are being compared?

6. How does the slope of your line compare to a decimal approximation of π?

7. What equation relating C (circumference) and d (diameter) would be an exact equation of the line going through the points (d, C) generated by the circles? What is the exact slope of that line?

8. What does it mean to say that π is a ratio?

9. What does it mean to say that the slope of a line is a ratio? In this activity, what quantities were being compared?

10. For the slope of any line, describe what types of quantities are being compared.

Review Rotation

1. Find a buddy.
2. Move around to each of the 4 stations.

Buddy A – complete the odd #s.

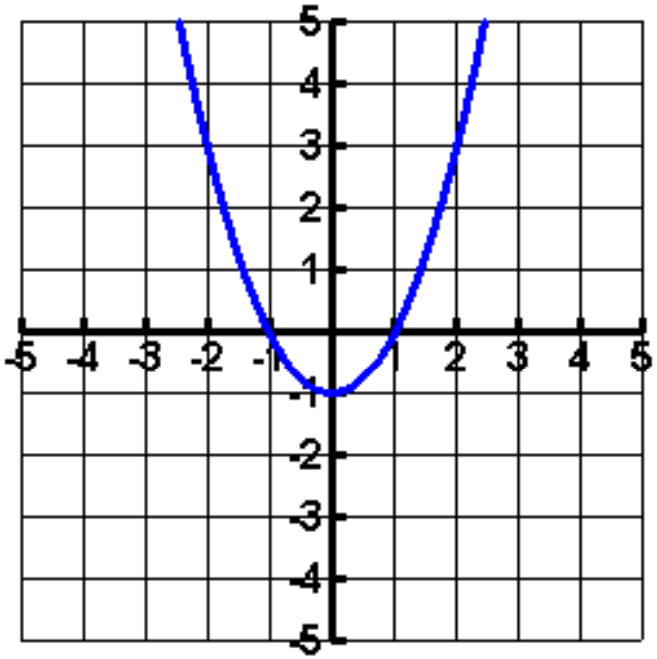
Buddy B – complete the even #s.

Check each other's work!!

Adapted from Various Sources

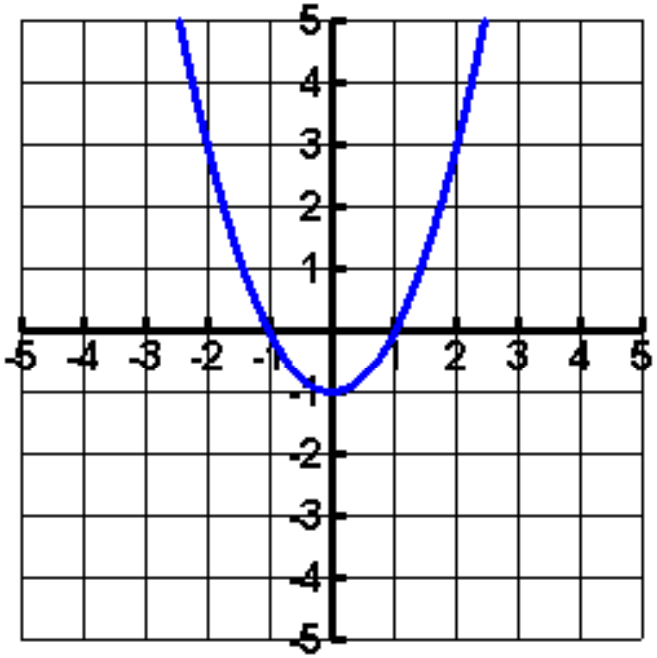
(MCC9-12.A.APR.1; MCC9-12.A.APR.3; MCC9-12.F.IF.7; MCC9-12.F.IF.7c; MCC9-12.A.REI.2)

Directions: Use the graph to analyze the function.



1. Domain: _____
2. Range: _____
3. Vertex: _____
4. Increasing: _____
5. Decreasing: _____
6. X-intercepts: _____
7. Y-intercept: _____
8. End behavior: _____
9. Minimum: _____
10. Maximum: _____

Directions: Use the graph to analyze the function.



1. Domain: $(-\infty, \infty)$
2. Range: $[-1, \infty)$
3. Vertex: $(0, -1)$
4. Increasing: $[0, \infty)$
5. Decreasing: $(-\infty, 0]$
6. X-intercepts: $(-1, 0)$ & $(1, 0)$
7. Y-intercept: $(0, -1)$
8. End behavior: Rises on left & right
9. Minimum: $(0, -1)$
10. Maximum: none

Directions: Given the transformation, write the equation.

11. Transform the equation $f(x) = x^2$ so that the graph is shifted to the right 5 units and shifted down 8 units:

12. Transform the equation $f(x) = \sqrt{x}$ so that the graph is reflected across the x-axis and shifted to the left 3 units:

13. Transform the equation $f(x) = |x|$ so that the graph is shifted to the right 1 unit, shifted down 2 units, and vertically stretched by a factor of 3:

14. Transform the equation $f(x) = x^3$ so that the graph is reflected across the x-axis, shifted up 11 units, and shifted to the left 6 units:

Directions: Given the transformation, write the equation.

11. Transform the equation $f(x) = x^2$ so that the graph is shifted to the right 5 units and shifted down 8 units:

$$g(x) = (x-5)^2 - 8$$

12. Transform the equation $f(x) = \sqrt{x}$ so that the graph is reflected across the x-axis and shifted to the left 3 units:

$$g(x) = -\sqrt{x+3}$$

13. Transform the equation $f(x) = |x|$ so that the graph is shifted to the right 1 unit, shifted down 2 units, and vertically stretched by a factor of 3:

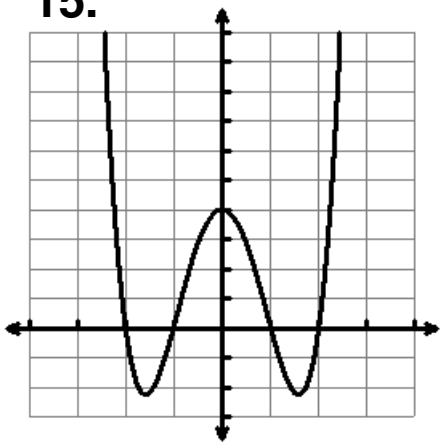
$$g(x) = 3|x-1| - 2$$

14. Transform the equation $f(x) = x^3$ so that the graph is reflected across the x-axis, shifted up 11 units, and shifted to the left 6 units:

$$g(x) = -(x+6)^3 + 11$$

Directions: Tell whether it is even, odd, or neither by examining the graphs.

15.



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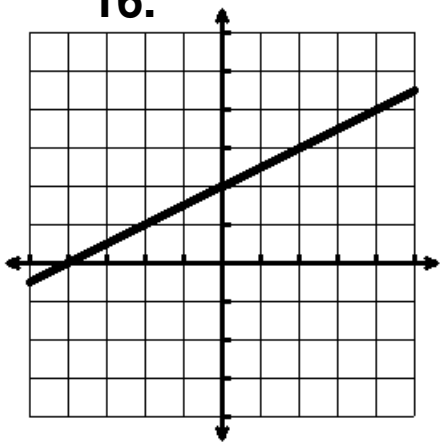

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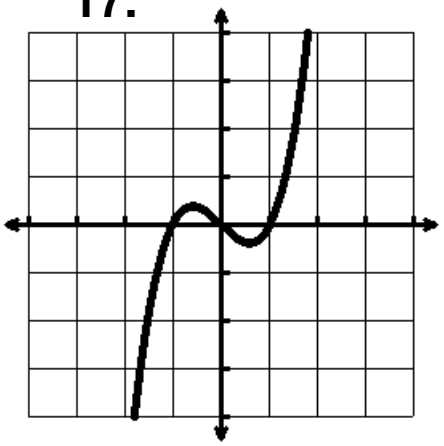

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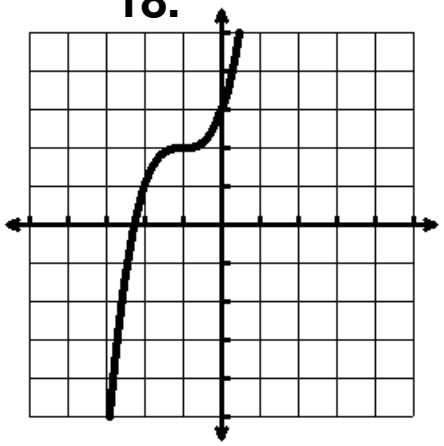


Directions: Tell whether it is even, odd, or neither by examining the equations.

19. $f(x) = 2x^2 - 4$

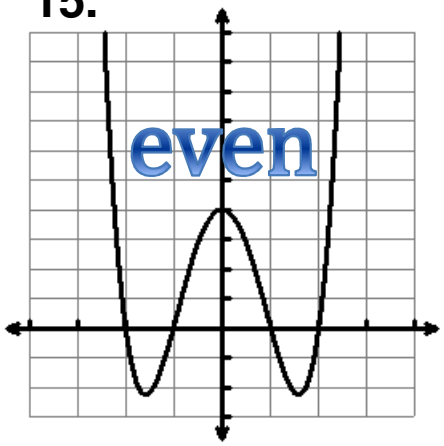
20. $f(x) = 4x^2 + 3x - 1$

21. $f(x) = x^3 - 2x + 1$

22. $f(x) = x^3 - x$

Directions: Tell whether it is even, odd, or neither by examining the graphs.

15.



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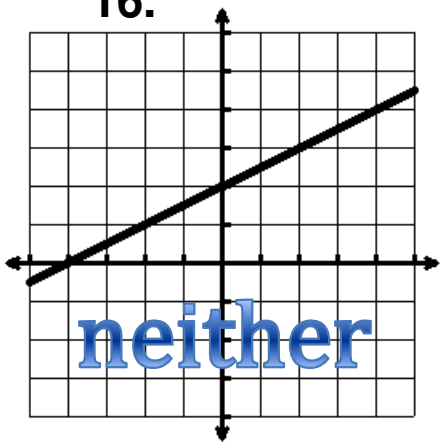

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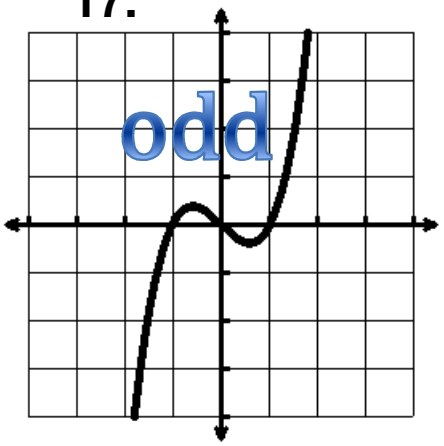

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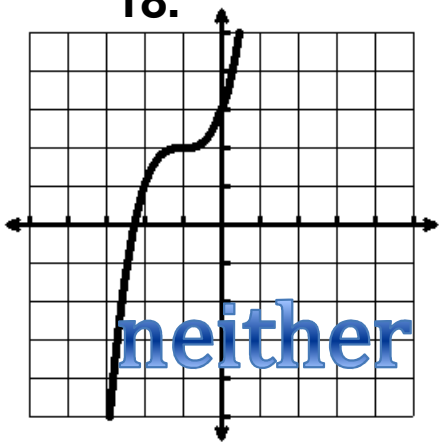

Directions: Tell whether it is even, odd, or neither by examining the equations.

19. $f(x)=2x^2-4$

even

20. $f(x)=4x^2+3x-1$

neither

21. $f(x)=x^3-2x+1$

neither

22. $f(x)=x^3-x$

odd

Directions: Factor completely.

23. $x^2 - 2x - 24$
24. $x^2 - 49$
25. $2x^2 - 14x + 20$
26. $3x^2 - 48$
27. $4x^2 - 12x + 36$
28. $x^2 + 15x + 50$

Directions: Factor completely.

23. $x^2 - 2x - 24$ $(x-6)(x+4)$
24. $x^2 - 49$ $(x-7)(x+7)$
25. $2x^2 - 14x + 20$ $2(x-5)(x-2)$
26. $3x^2 - 48$ $3(x-4)(x+4)$
27. $4x^2 - 12x + 36$ Not factorable
28. $x^2 + 15x + 50$ $(x+10)(x+5)$

Directions: Simplify the following expressions.

29. $(4x^3 + 3x^2 - 7x) + (7x^2 + 2x - 10)$

30. $(x^2 + 4x^3 - 7x - 5) - (3x^2 - 4 - 4x + 6x^3)$

31. $(3x + 5)(2x - 7)$

32. $(2x - 3)^2$

Directions: Simplify the following expressions.

29. $(4x^3 + 3x^2 - 7x) + (7x^2 + 2x - 10)$

$4x^3 + 10x^2 - 5x - 10$

30. $(x^2 + 4x^3 - 7x - 5) - (3x^2 - 4 - 4x + 6x^3)$

$-2x^3 - 2x^2 - 3x - 1$

31. $(3x + 5)(2x - 7)$

$6x^2 - 11x - 35$

32. $(2x - 3)^2$

$4x^2 - 12x + 9$

Directions: Solve for x.

33. $x^2 + 5x + 6 = 0$

33. $x^2 - 3x - 10 = 0$

33. $x^3 + 2x^2 - 8x = 0$

34. $x^2 - 10x + 24 = 0$

Directions: Solve for x.

33. $x^2 + 5x + 6 = 0$

$(x+3)(x+2) = 0$

$x = -3 \quad x = -2$

33. $x^2 - 3x - 10 = 0$

$(x-5)(x+2) = 0$

$x = 5 \quad x = -2$

33. $x^3 + 2x^2 - 8x = 0$

$x(x+4)(x-2) = 0$

$x = 0 \quad x = -4 \quad x = 2$

34. $x^2 - 10x + 24 = 0$

$(x-12)(x+2) = 0$

$x = 12 \quad x = -2$

Directions: Solve for x.

35. $4\sqrt{x} + 16 = 8$

36. $3\sqrt{x} - 2 + 5 = 11$

37. $2\sqrt{x-3} + 6 = 12$

38. $2\sqrt{x} - 24 = 0$

Directions: Solve for x.

35. $4\sqrt{x} + 16 = 8$

x = 4

36. $3\sqrt{x} - 2 + 5 = 11$

x = -64/9

37. $2\sqrt{x-3} + 6 = 12$

x = 12

38. $2\sqrt{x} - 24 = 0$

x = 144

Directions: Solve for x.

39. $\frac{x}{6} - \frac{2}{3x} = \frac{1}{2}$

40. $\frac{8}{x+3} = \frac{x+1}{x}$

41. $\frac{x}{4} - \frac{2}{x} = \frac{1}{2}$

42. $\frac{6}{x+2} = \frac{x+1}{x}$

43. $\frac{4}{x+1} = \frac{3}{x+2}$

44. $\frac{4}{x-2} + \frac{2}{3} = \frac{6}{x-2}$

Directions: Solve for x.

39. $\frac{x}{6} - \frac{2}{3x} = \frac{1}{2}$

x = -1 x = 4

40. $\frac{8}{x+3} = \frac{x+1}{x}$

x = 1 x = 3

41. $\frac{x}{4} - \frac{2}{x} = \frac{1}{2}$

x = -2 x = 4

42. $\frac{6}{x+2} = \frac{x+1}{x}$

x = 1 x = 2

43. $\frac{4}{x+1} = \frac{3}{x+2}$

x = -5

44. $\frac{4}{x-2} + \frac{2}{3} = \frac{6}{x-2}$

x = 5