

Section 2.2 Notes

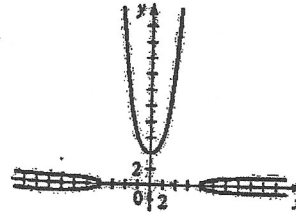
- I can find the x and y-intercepts of an equation from a graph and an equation.
- I know the definition of symmetry and can test an equation for symmetry.
- I can write the equation of a circle and can graph a circle.

Determine whether the points are on the graph of the equation:

4. $y(x^2 + 1) = 1$; $(1, 1)$, $(1, \frac{1}{2})$, $(-1, \frac{1}{2})$

An equation and its graph are given; Find the x and y intercepts.

10. $x^2 + y^3 - x^2y^2 = 64$



Find the x and y intercepts of a function:

x-intercept:

y-intercept:

Find the x and y-intercepts of the graph of the equation.

12. $y = x^2 - 5x + 6$

16. $y = \sqrt{x + 1}$

Tests for Symmetry:

About the x-axis:

About the y-axis:

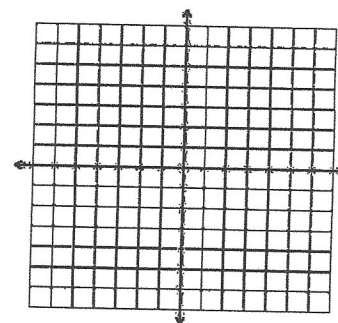
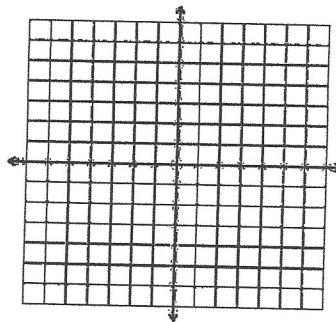
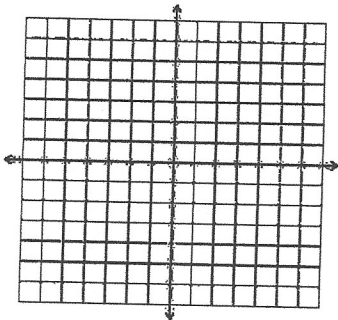
About the origin:

Make a table of values and sketch the graph of the equation. Find the x and y-intercepts and test for symmetry.

24. $x + y = 3$

26. $y = x^2 + 2$

28. $8y = x^3$

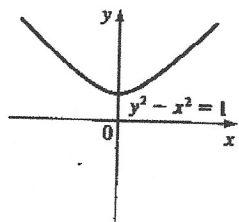


Test the equation for Symmetry:

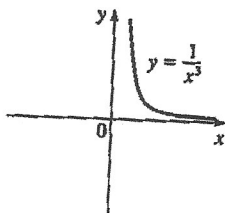
46. $x = y^4 - y^2$

Complete the graph using the given symmetry property:

52. Symmetric with respect to the x -axis



54. Symmetric with respect to the origin



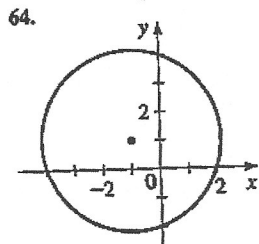
Equation of a circle:

Find an equation of the circle that satisfies the given condition:

56. Center $(2, -1)$; radius 8

60. Endpoints of a diameter are $P(-1, 1)$ and $Q(5, 5)$

Find the equation of the circle shown in the figure:



Completing the Square:

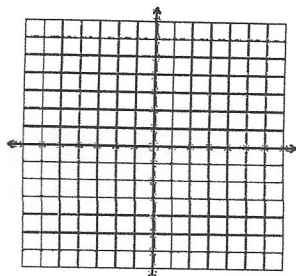
Original equation	$x^2 + 6x - 7 = 0$

Show that the equation represents a circle, and find the center and radius of the circle:

66. $x^2 + y^2 - 2x - 2y = 2$

Sketch the graph of the equation:

73. $x^2 + y^2 + 4x - 10y = 21$



Notes Section 2.4: Write equations of lines:

★ Find the slope (rate of change) given two points

★ Write an equation of a line given:

Slope, y-intercept

Point and Slope

Two points

Points and parallel/perpendicular line:

From context

Slope of a non-vertical line:

1-8 Find the slope of the line through P and Q.

5- $P(2, 4), Q(4, 12)$

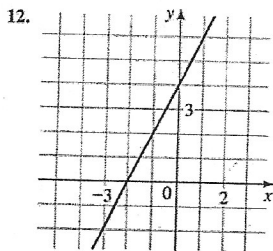
Slope-Intercept Form:

Standard Equation of a Line:

General Equation of a Line:

11-14 Find an equation for the line whose graph is sketched.

Find the y-intercept and the slope and substitute in slope-intercept form: $y = mx + b$



Point-Slope Form:

15-34 Find an equation of a line that satisfies the given conditions:

18. Through $(-3, -5)$; slope = $-\frac{7}{2}$;

22. slope = $\frac{2}{5}$; y - intercept 4

24. x - intercept = -8 ; y - intercept = 6

Two non-vertical lines are parallel if and only if they have the _____ slope

Two lines are perpendicular if and only if they slopes _____ :

Also, a horizontal line (slope 0) is perpendicular to a vertical line (undefined slope)

Examples: Slope Parallel Perpendicular

28. $y - \text{intercept} = 6$; parallel to the line $2x + 3y + 4 = 0$

32. Through $(\frac{1}{2}, -\frac{2}{3})$; perpendicular to the line $4x - 8y = 1$

41- 52 Find the slope and y-intercept of the line and draw its graph:

46. $-3x - 5y + 30 = 0$

50. $x = -5$

61-72 Applications

62. **Global Warming** Some scientists believe that the averaging surface temperature of the world has been rising steadily. The average surface temperature is given by:

$$T = 0.02t + 8.50$$

where T is the temperature in Celsius and t is in years since 1990.

(a) What do the slope and T-intercept represent?

(b) Use the equation to predict the average global surface temperature in 2100.

72. **Manufacturing Cost** The manager of a furniture factory finds that it costs \$2200 to manufacture 100 chairs in one day and \$4800 to produce 300 chairs in one day.

(a) Assuming that the relationship between cost and the number of chairs produced is linear, find an equation that expresses this relationship. Then graph the equation.

(b) What is the slope of the line in part (a), what does it represent?

(c) What is the y-intercept of this line, and what does it represent?

Section 2.2 Notes

- I can graph an equation by making a table of values.
- I can find the x and y-intercepts of an equation from a graph and an equation.
- I know the definition of symmetry and can test an equation for symmetry.
- I can find the equation of a circle given points, radius or center of the circle.
- I can find the equation of a circle by completing the square.
- I can sketch the graph of a circle.

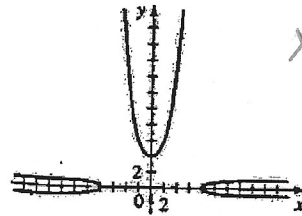
Determine whether the points are on the graph of the equation:

4. $y(x^2 + 1) = 1$; $(1, 1), (1, \frac{1}{2}), (-1, \frac{1}{2})$

$1(1^2 + 1) \neq 1$
 $\frac{1}{2}(1^2 + 1) = 1 \checkmark$
 $\frac{1}{2}(-1)^2 + 1 = 1 \checkmark$

An equation and its graph are given; Find the x and y intercepts.

10. $x^2 + y^3 - x^2y^2 = 64$



x-int $(\pm 8, 0)$
 y-int $(0, 4)$

Find the x and y intercepts of a function:

x-intercept:

set $y = 0$ $(x, 0)$

y-intercept:

set $x = 0$ $(0, y)$

Find the x and y-intercepts of the graph of the equation.

12. $y = x^2 - 5x + 6$ y-int $(0, 6)$

$y = (x-2)(x-3)$
 x-int $(2, 0)(3, 0)$

16. $y = \sqrt{x+1}$

x-int $(-1, 0)$
 y-int $(0, 1)$

Tests for Symmetry:

About the x-axis:

equivalent equation when all y's are replaced with $(-y)$

About the y-axis:

x's are replaced with $(-x)$

About the origin:

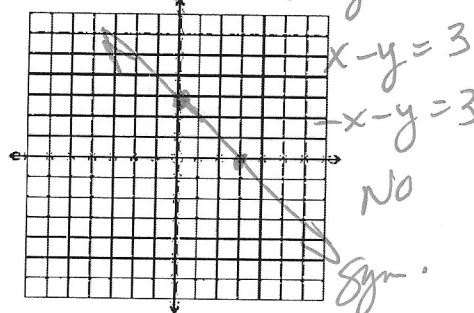
x's and y's are both replaced with $(-x)$ and $(-y)$

Make a table of values and sketch the graph of the equation.

Find the x and y-intercepts and test for symmetry.

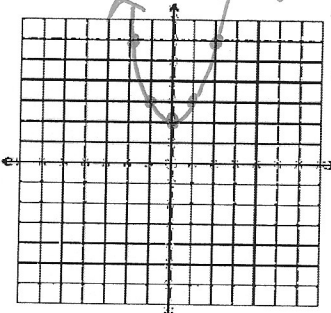
24. $x + y = 3$

$-x + y = 3$



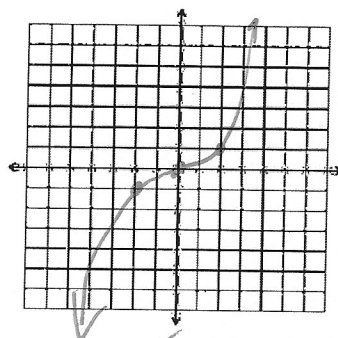
26. $y = x^2 + 2$

$y = (-x)^2 + 2 = x^2 + 2$



28. $8y = x^3$

$y = \frac{1}{8}x^3$



x	y
2	1
0	0
-2	-1

Test the equation for Symmetry:

46. $x = y^4 - y^2$

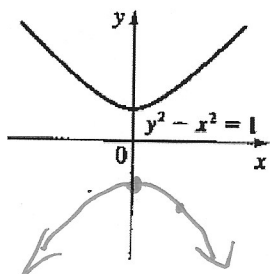
$-x = y^4 - y^2$ (no)

$x = (-y)^4 - (-y)^2 = y^4 - y^2$ Sym w/ x-axis

$8(-y) = (-x)^3$
 $-8y = -x^3$
 $8y = x^3$

Complete the graph using the given symmetry property:

52. Symmetric with respect to the x-axis



Equation of a circle:

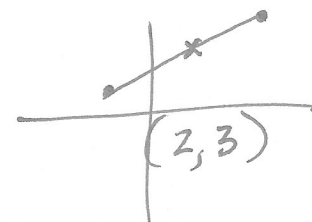
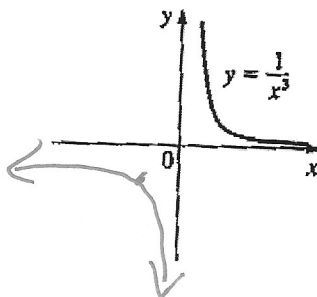
$$(x-h)^2 + (y-k)^2 = r^2$$

Find an equation of the circle that satisfies the given condition:

56. Center $(2, -1)$; radius 8

$$(x+1)^2 + (y-2)^2 = 64$$

54. Symmetric with respect to the origin

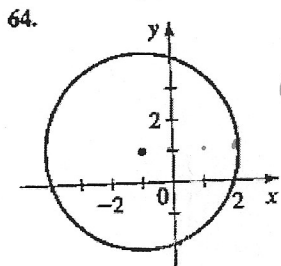


$$\sqrt{6^2 + 4^2} = 2r = \sqrt{52}$$

60. Endpoints of a diameter are $P(-1, 1)$ and $Q(5, 5)$

$$(x-2)^2 + (y-3)^2 = 13 \quad C(2, 3) \quad \sqrt{3^2 + 2^2} = \sqrt{13}$$

Find the equation of the circle shown in the figure:



64. $C(-1, 1)$
 $r = 3$

$$(x+1)^2 + (y-1)^2 = 9$$

Completing the Square:

Original equation	$x^2 + 6x - 7 = 0$
8/2 move constant	$x^2 + 6x = 7$
1/2 $(\frac{b}{2})^2$ add to both sides	$x^2 + 6x + 9 = 7 + 9$
Change to squared form	$(x+3)^2 = 16$

Show that the equation represents a circle, and find the center and radius of the circle:

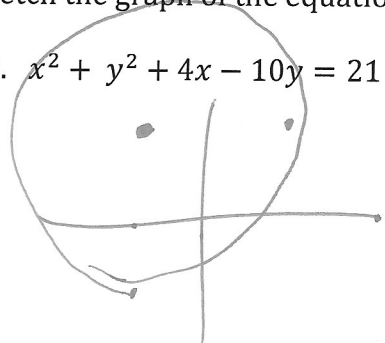
66. $x^2 + y^2 - 2x - 2y = 2$

$$x^2 - 2x + 1 + y^2 - 2y + 1 = 2 + 1 + 1 \quad C(1, 1)$$

$$(x-1)^2 + (y-1)^2 = 4 \quad r = 2$$

Sketch the graph of the equation:

73. $x^2 + y^2 + 4x - 10y = 21$



$$x^2 + 4x + 4 + y^2 - 10y + 25 = 21 + 4 + 25$$

$$(x+2)^2 + (y-5)^2 = 50$$

Notes Section 2.4: Write equations of lines:

★ Find the slope (rate of change) given two points

★ Write an equation of a line given:

Slope, y-intercept

Point and Slope

Two points

Points and parallel/perpendicular line:

From context

Slope of a non-vertical line:

$$m = \frac{\Delta y}{\Delta x} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{\text{rise}}{\text{run}}$$

1-8 Find the slope of the line through P and Q.

5- P(2, 4), Q(4, 12)

$$\frac{12-4}{4-2} = \frac{8}{2} = 4$$

Slope-Intercept Form:

$$y = mx + b$$

Standard Equation of a Line:

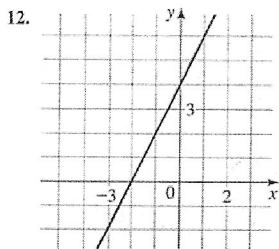
$$Ax + By = C$$

General Equation of a Line:

$$Ax + By + C = 0$$

11-14 Find an equation for the line whose graph is sketched.

Find the y-intercept and the slope and substitute in slope-intercept form: $y = mx + b$



$$b = 4$$

$$m = 2$$

$$y = 2x + 4$$

$$2x - y + 4 = 0$$

Point-Slope Form:

$$y - y_1 = m(x - x_1)$$

15-34 Find an equation of a line that satisfies the given conditions:

18. Through $(-3, -5)$; slope = $-\frac{7}{2}$; $y = -\frac{7}{2}x - \frac{31}{2}$

$$y + 5 = -\frac{7}{2}(x + 3)$$

$$-\frac{7}{2}x - \frac{21}{2}$$

$$2y = -7x - 31$$

$$7x + 2y + 31 = 0$$

22. slope = $\frac{2}{5}$; y-intercept 4

$$y = \frac{2}{5}x + 4$$

$$5y = 2x + 20$$

$$2x - 5y + 20 = 0$$

24. x-intercept = -8 ; y-intercept = 6

$$(-8, 0) (0, 6) \quad m = \frac{6-0}{0-(-8)} = \frac{6}{8} = \frac{3}{4}$$

$$y = \frac{3}{4}x + 6$$

$$4y = 3x + 24$$

$$3x - 4y + 24 = 0$$

Two non-vertical lines are parallel if and only if they have the Same slope

Two lines are perpendicular if and only if they slopes opposite reciprocal :
Also, a horizontal line (slope 0) is perpendicular to a vertical line (undefined slope)

Examples:

	Slope	Parallel	Perpendicular
28.	$\frac{2}{3}$ $-\frac{3}{2}$	$\frac{2}{3}$ $-\frac{3}{2}$	$-\frac{1}{2}$ $\frac{2}{3}$ -3

y -intercept = 6; parallel to the line $2x + 3y + 4 = 0$

$m = -\frac{2}{3}$

$y = -\frac{2}{3}x + 6$
 $3y = -2x + 18$

$2x + 3y - 18 = 0$

32. Through $(\frac{1}{2}, -\frac{2}{3})$; perpendicular to the line $4x - 8y = 1$

$m = -2$

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

$y = -2x + \frac{1}{3}$
 $3y = -6x + 1$
 $6x + 3y - 1 = 0$

41-52 Find the slope and y-intercept of the line and draw its graph:

46. $-3x - 5y + 30 = 0$ $m = -\frac{A}{B}$ $b = -\frac{C}{B}$

$m = -\frac{3}{5}$ $b = -\frac{30}{-5} = 6$

50. $x = -5$

slope: undefined no y-int

61-72 Applications

62. **Global Warming** Some scientists believe that the averaging surface temperature of the world has been rising steadily. The average surface temperature is given by:

$T = 0.02t + 8.50$

where T is the temperature in Celsius and t is in years since 1990.

- (a) What do the slope and T-intercept represent?
- (b) Use the equation to predict the average global surface temperature in 2100.

a) slope: temp rises .02 every year t-int: 8.5 beginning temp in 1990

b) $T = 0.02(110) + 8.5 = 10.7$

72. **Manufacturing Cost** The manager of a furniture factory finds that it costs \$2200 to manufacture 100 chairs in one day and \$4800 to produce 300 chairs in one day.

- (a) Assuming that the relationship between cost and the number of chairs produced is linear, find an equation that expresses this relationship. Then graph the equation.
- (b) What is the slope of the line in part (a), what does it represent?
- (c) What is the y-intercept of this line, and what does it represent?

a) $(100, 2200)$ $(300, 4800)$

$\frac{4800 - 2200}{300 - 100} = 13$ $y - 2200 = 13(x - 100)$

$y = 13x + 900$

- b) Slope is 13 costs \$13 for each chair
- c) y-int is 900 Costs \$900 to begin to make chairs

