

CHAPTER 10

ABSOLUTE VALUE GRAPHS AND THE CONIC SECTIONS

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| 5. Odd Answers for Chapter 10 | p. 274 |

10.1 SOLVING ABSOLUTE VALUE EQUATIONS

STEPS:

1. Isolate the absolute value.
2. Write two equations. The stuff inside = ^{pos} the # and then the stuff inside = ^{neg} the #.
3. Solve each one.

EXAMPLES:

<p>1. $X = 4$</p> <p>$X = 4$ or $X = -4$</p>	<p>2. $X + 3 + 6 = 8$</p> <p style="text-align: center;">$\frac{-6 \quad -6}{-6 \quad -6}$</p> <p>$X + 3 = 2$</p> <p>$X + 3 = 2$ or $X + 3 = -2$</p> <p style="text-align: center;">$\frac{-3 \quad -3 \quad -3 \quad -3}{-3 \quad -3 \quad -3 \quad -3}$</p> <p>$X = -1$ or $X = -5$</p>	<p>3. $-3 X + 7 - 2 = -14$</p> <p style="text-align: center;">$\frac{+2 \quad +2}{+2 \quad +2}$</p> <p>$-3 X + 7 = -12$</p> <p style="text-align: center;">$\frac{-3 \quad -3}{-3 \quad -3}$</p> <p>$X + 7 = 4$</p> <p>$X + 7 = 4$ or $X + 7 = -4$</p> <p style="text-align: center;">$\frac{-7 \quad -7 \quad -7 \quad -7}{-7 \quad -7 \quad -7 \quad -7}$</p> <p>$X = -3$ or $X = -11$</p>
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To solve and graph an absolute value inequality on a number line, LESS THANS become ANDS or INTERSECTIONS and GREATER THANS become ORS or UNIONS.

4. $4|X + 3| < 8$

$\frac{4 \quad 4}{4 \quad 4}$

$|X + 3| < 2$

For the answer to be below 2, the thing in the absolute value would have to lie between -2 and 2.

so $X + 3 > -2$ AND $X + 3 < 2$

$\frac{-3 \quad -3 \quad -3 \quad -3}{-3 \quad -3 \quad -3 \quad -3}$

$X > -5$ AND $X < 1$

5. $-2|2X - 4| + 8 \leq -6$

$\frac{-8 \quad -8}{-8 \quad -8}$

$-2|2X - 4| \leq -14$

$\frac{\ominus 2 \quad \downarrow \quad \ominus 2}{\ominus 2 \quad \downarrow \quad \ominus 2}$

$|2X - 4| \geq 7$

÷ by neg flip symbol

For the answer to be 7 or more, the thing in the absolute value would have to be > 7 or < -7 .

so $2X - 4 < -7$ OR $2X - 4 > 7$

$\frac{+4 \quad +4 \quad +4 \quad +4}{+4 \quad +4 \quad +4 \quad +4}$

$\frac{2X < -3}{2} \quad \text{OR} \quad \frac{2X > 11}{2}$

$X < -1.5$ OR $X > 5.5$

PRACTICE:

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1. $|X| = 5$

2. $5|X + 7| = 15$

3. $-3|2X + 4| + 6 = -24$

$X = 5$

$X = -4$

$X = 3$

$X = -5$

$X = -10$

$X = -7$

Solve and then graph on a number line.

4. $|X| > 5$

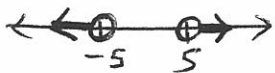
5. $|X| < 5$

6. $4|X| + 3 \leq 11$

$X < -5$ OR $X > 5$

$X > -5$ AND $X < 5$

$X \geq -2$ AND $X \leq 2$



7. $-2|3X + 6| - 4 \leq -16$

8. $5|5X + 5| + 5 < 5$

$X \geq -4$ AND $X \leq 0$

false statement



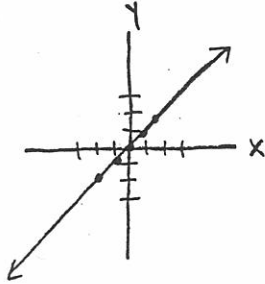
no solutions

10.2 TABLES GRAPHS AND EQUATIONS

EXAMPLES:

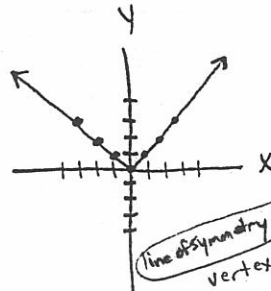
1. $Y = X$

X	X	Y
-2	-2	-2
-1	-1	-1
0	0	0
1	1	1
2	2	2



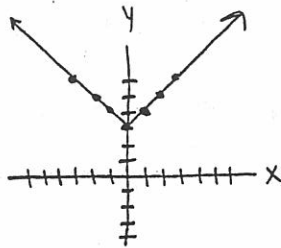
2. $Y = |X|$

X	X	Y
-3	-3	3
-2	-2	2
-1	-1	1
0	0	0
1	1	1
2	2	2
3	3	3



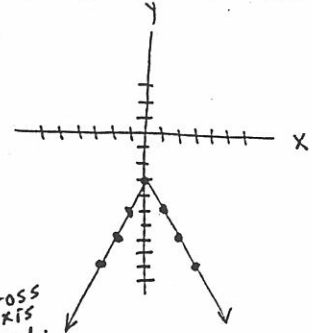
3. $Y = |X| + 3$

X	X + 3	Y
-3	-3 + 3	6
-2	-2 + 3	5
-1	-1 + 3	4
0	0 + 3	3
1	1 + 3	4
2	2 + 3	5
3	3 + 3	6



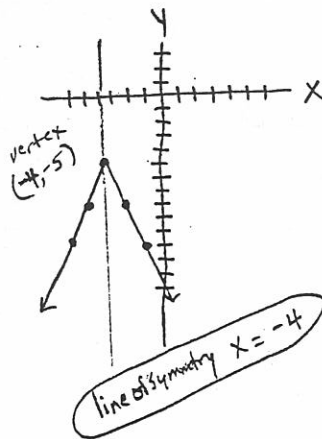
4. $Y = -2|X| - 3$

X	-2 X - 3	Y
-3	-2 -3 - 3	-9
-2	-2 -2 - 3	-7
-1	-2 -1 - 3	-5
0	-2 0 - 3	-3
1	-2 1 - 3	-5
2	-2 2 - 3	-7
3	-2 3 - 3	-9



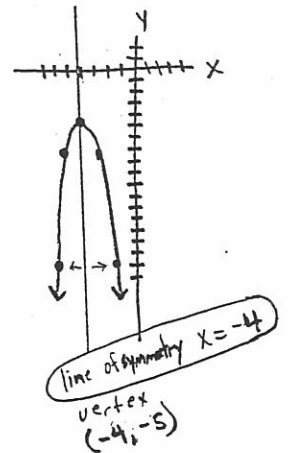
5. $Y = -3|X + 4| - 5$

X	-3 X+4 - 5	Y
-3	-3 -3+4 - 5	-8
-2	-3 -2+4 - 5	-11
-1	-3 -1+4 - 5	-14
0	-3 0+4 - 5	-17
1	-3 1+4 - 5	-20
2	-3 2+4 - 5	-23
3	-3 3+4 - 5	-26
-4	-3 -4+4 - 5	-5
-5	-3 -5+4 - 5	-8
-6	-3 -6+4 - 5	-11



6. $Y = -3(X + 4)^2 - 5$

X	-3(X+4)^2 - 5	Y
-3	-3(-3+4)^2 - 5	-8
-2	-3(-2+4)^2 - 5	-17
-1	-3(-1+4)^2 - 5	-32
0	-3(0+4)^2 - 5	-53
1	-3(1+4)^2 - 5	-80
2	-3(2+4)^2 - 5	-113
3	-3(3+4)^2 - 5	-152
-4	-3(-4+4)^2 - 5	-5
-5	-3(-5+4)^2 - 5	-8
-6	-3(-6+4)^2 - 5	-17



$\frac{\Delta y}{\Delta x}$	-3	-3	-3	-3	-3	-3	-3	then	3	3	3
	1	1	1	1	1	1	1		1	1	1

Notice on absolute value

PRACTICE: (Supply the missing equation and graph.) 266

1. X -2 -1 0 1 2

Y -5 -1 3 7 11

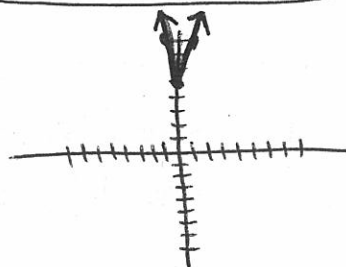
$y = 4x + 3$ linear



2. X -2 -1 0 1 2

Y 11 8 5 8 11

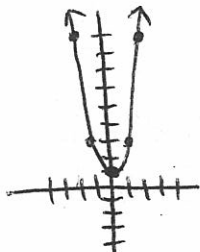
$y = 3|x| + 5$ absolute value



3. X -2 -1 0 1 2

Y 9 3 1 3 9

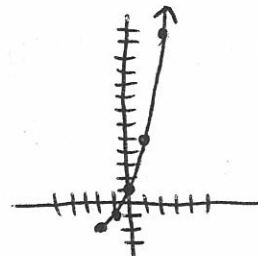
$y = 2x^2 + 1$ quadratic



4. X -2 -1 0 1 2

Y -2 -1 1 5 13

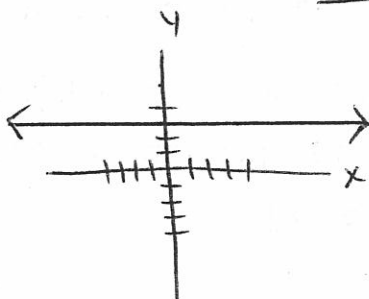
$y = 4 \cdot 2^x - 3$ exponential



5. X -2 -1 0 1 2

Y 3 3 3 3 3

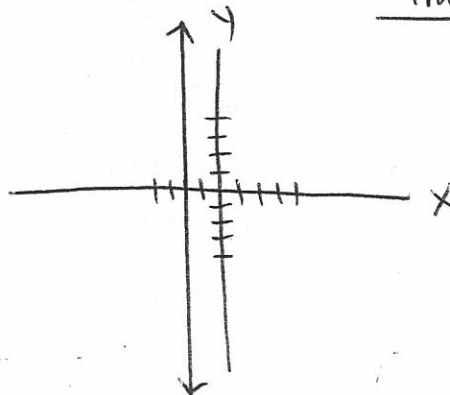
$y = 3$ horizontal line



6. X -2 -2 -2 -2 -2

Y -2 -1 0 1 2

$x = -2$ vertical line



10.3 PARABOLAS , CIRCLES , ELLIPSES , HYPERBOLAS 267

RULE 1: PARABOLA $Y = a(X - h)^2 + k$ (h, k) is the vertex
and $X = h$ is the axis of symmetry. If the quadratic

is in standard form then the axis of symmetry is $X = \frac{-b}{2a}$.

If "a" is positive then the vertex is a minimum. (opens up)

If "a" is negative then the vertex is a maximum. (opens down)

When $|a|$ gets bigger , the wings fold in.

RULE 2: CIRCLE $(X - h)^2 + (Y - k)^2 = r^2$

(h, k) is the center "r" is the radius

RULE 3: ELLIPSE $\frac{(X - h)^2}{a^2} + \frac{(Y - k)^2}{b^2} = 1$

(h, k) is the center. The dilation in the X-direction
is a and the dilation (stretch) in the Y-direction is b .

RULE 4: HYPERBOLA $\frac{(X - h)^2}{a^2} - \frac{(Y - k)^2}{b^2} = 1$

(h, k) is the center. The asymptotes have slopes

of $\pm \frac{b}{a}$. If the "X" part is positive then it opens on

the X-axis and the vertices are $(h \pm a, k)$. If the

"Y" part is positive then it opens on the Y-axis and

the vertices are $(h, k \pm b)$.

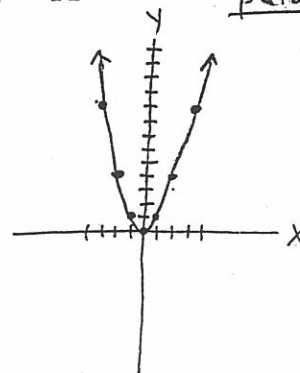
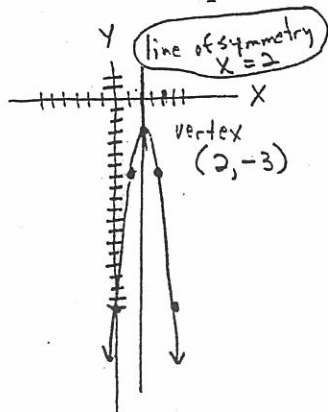
EXAMPLES:

1. $Y = -4(X - 2)^2 - 3$

compared to $Y = X^2$

parabola

X	$-4(X-2)^2 - 3$	Y
-1	$-4(-1-2)^2 - 3$	-39
0	$-4(0-2)^2 - 3$	-19
1	$-4(1-2)^2 - 3$	-7
2	$-4(2-2)^2 - 3$	-3
3	$-4(3-2)^2 - 3$	-7
4	$-4(4-2)^2 - 3$	-19
5	$-4(5-2)^2 - 3$	-39

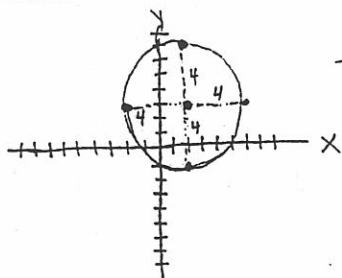


2. $(X - 2)^2 + (Y - 3)^2 = 4^2$

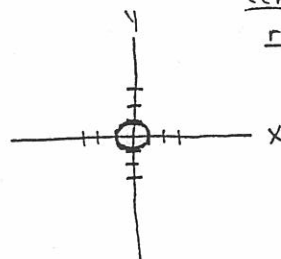
compared to $X^2 + Y^2 = 1$

center (2, 3) radius 4

(The UNIT circle.)



circle



center (0, 0)
radius 1

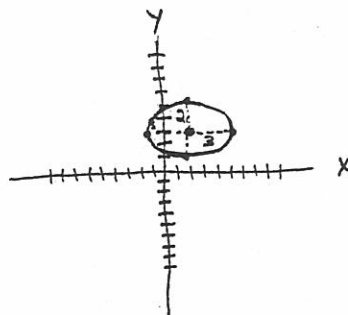
3. $\frac{(X - 2)^2}{9} + \frac{(Y - 3)^2}{4} = 1$

ellipse

center (2, 3)

x-dilation $\sqrt{9} = \pm 3$

y-dilation $\sqrt{4} = \pm 2$



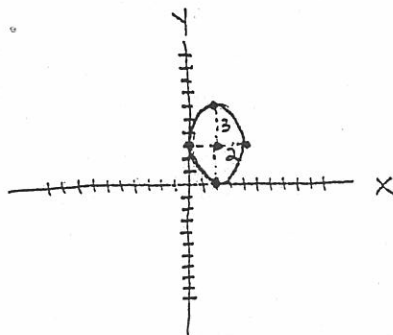
$$4. \frac{(X-2)^2}{4} + \frac{(Y-3)^2}{9} = 1 \quad \text{ellipse}$$

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center (2, 3)

x-dilation $\sqrt{4} = \pm 2$

y-dilation $\sqrt{9} = \pm 3$

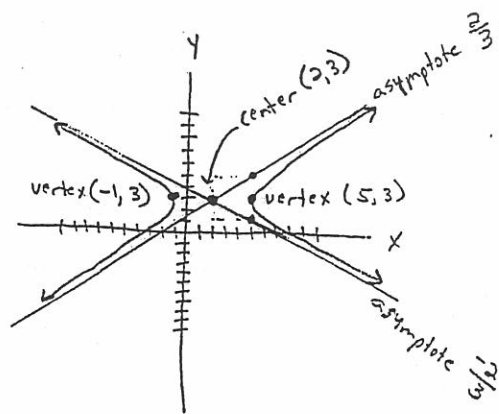


$$5. \frac{(X-2)^2}{9} - \frac{(Y-3)^2}{4} = 1 \quad \text{hyperbola}$$

center (2, 3)

vertices $(2 \pm \sqrt{9}, 3)$
 $(2 \pm 3, 3)$
 $(5, 3)$ and $(-1, 3)$

asymptotes slopes $\pm \frac{\sqrt{4}}{\sqrt{9}} \quad \frac{2}{3}$ or $-\frac{2}{3}$

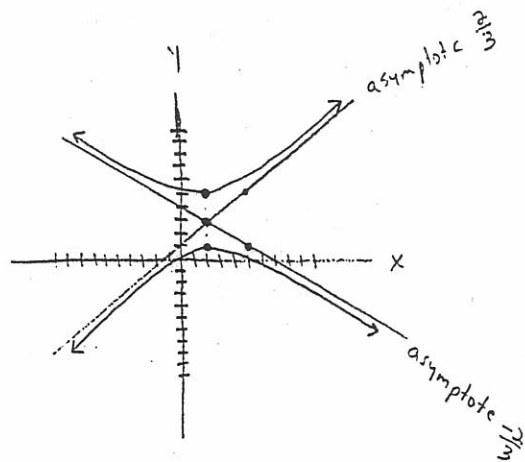


$$6. -\frac{(X-2)^2}{9} + \frac{(Y-3)^2}{4} = 1$$

center (2, 3)

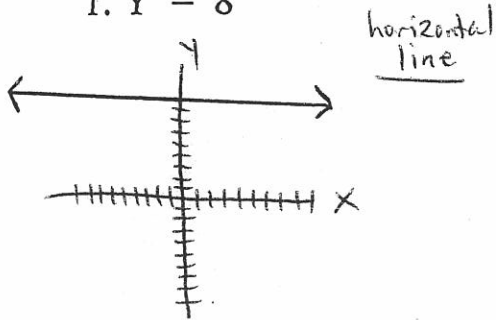
vertices $(2, 3 \pm \sqrt{4})$
 $(2, 3 \pm 2)$
 $(2, 5)$ and $(2, 1)$

asymptote slopes $\pm \frac{\sqrt{4}}{\sqrt{9}} \quad \frac{2}{3}$ or $-\frac{2}{3}$

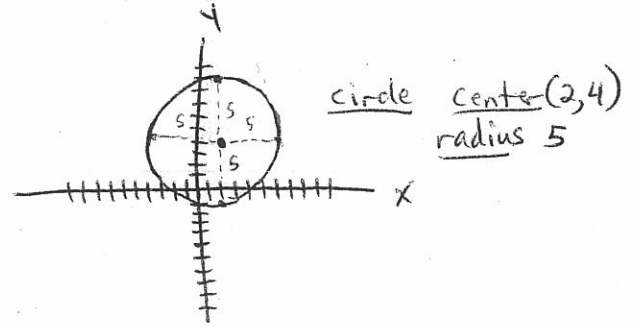


PRACTICE: (Graph each.)

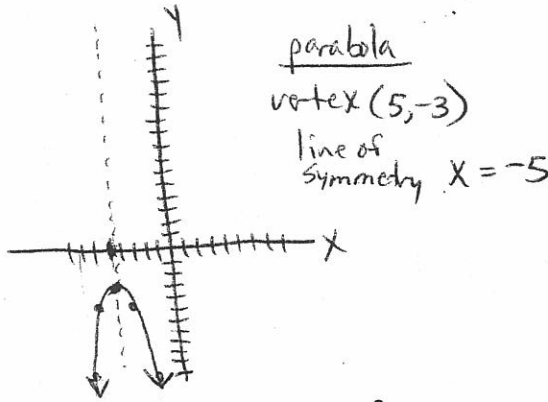
1. $Y = 8$



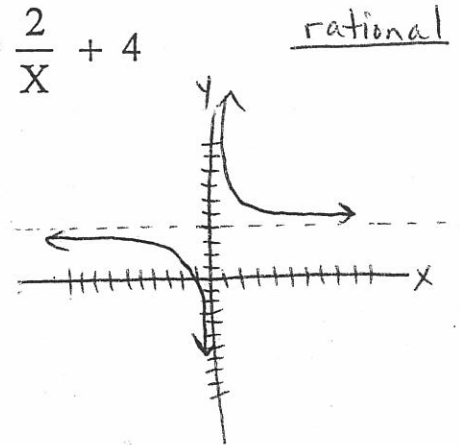
2. $(X - 2)^2 + (Y - 4)^2 = 25$



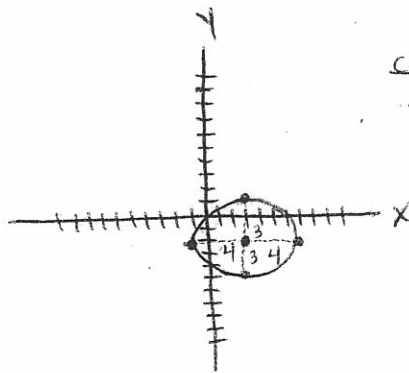
3. $Y = -2(X + 5)^2 - 3$



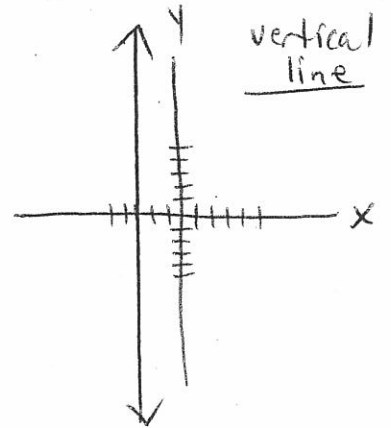
4. $Y = \frac{2}{X} + 4$



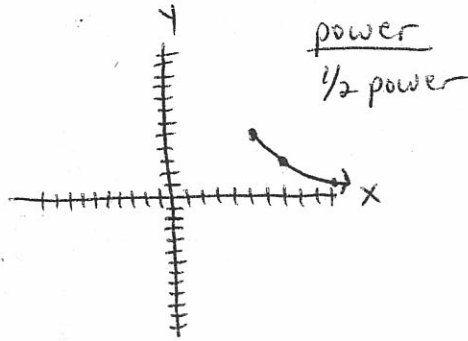
5. $\frac{(X - 3)^2}{16} + \frac{(Y + 2)^2}{9} = 1$



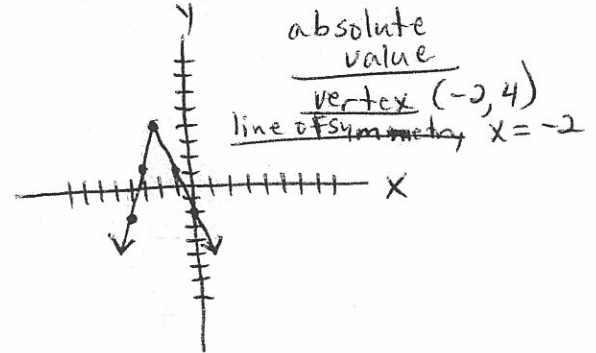
6. $X = -3$



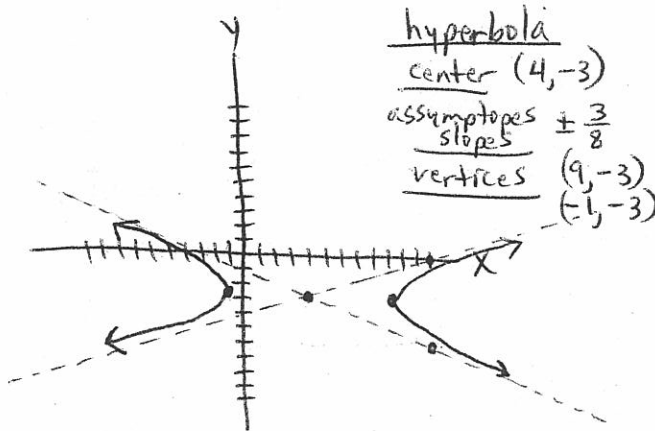
7. $Y = -2\sqrt{X - 6} + 5$



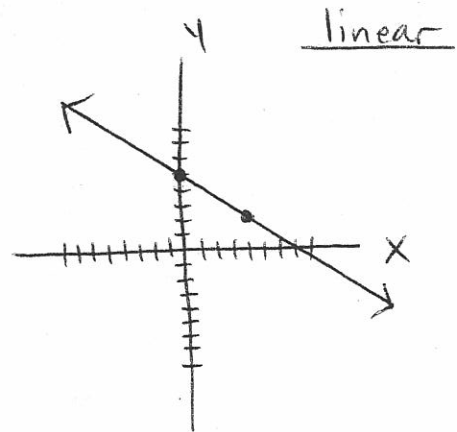
8. $Y = -3|X + 2| + 4$ 271



9. $\frac{(X - 4)^2}{25} - \frac{(Y + 3)^2}{16} = 1$



10. $Y = -\frac{3}{4}X + 5$

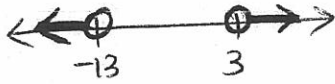


PRE-TEST PRACTICE AND REVIEW FOR CHAPTER 10 272

Solve and graph on a number line.

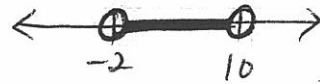
1. $3|X + 5| + -6 > 18$

$X < -13$ OR $X > 3$



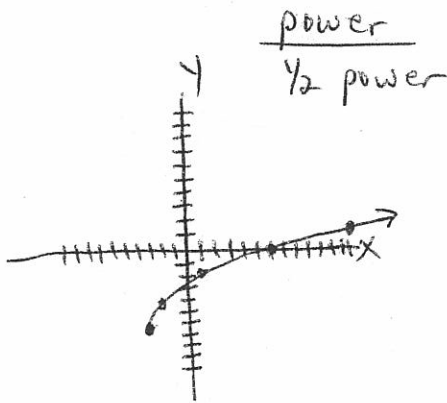
2. $-3|X - 4| + 3 > -15$

$X > -2$ AND $X < 10$

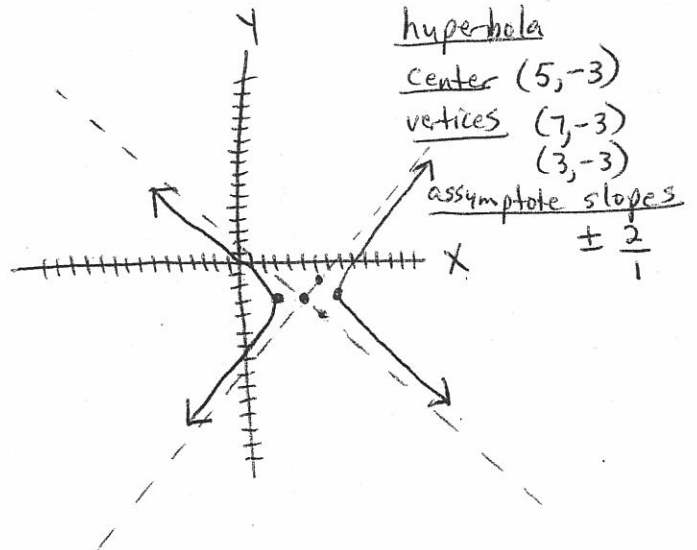


Graph each of the following on a coordinate plane.

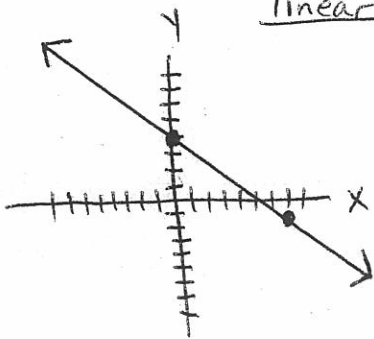
3. $Y = 2\sqrt{X+3} - 6$



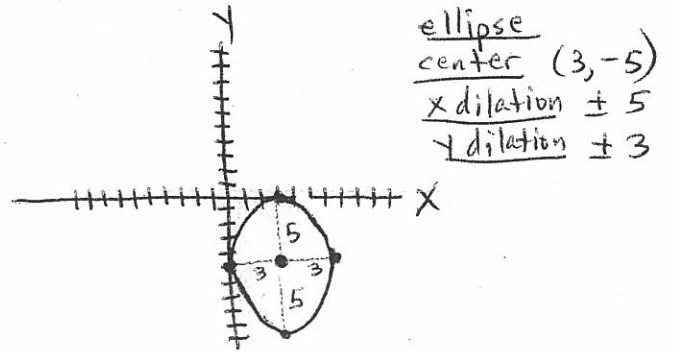
4. $\frac{(X - 5)^2}{4} - \frac{(Y + 3)^2}{16} = 1$



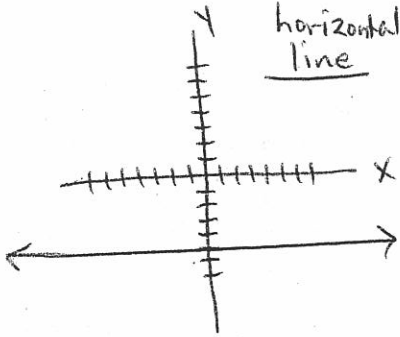
5. $Y = -\frac{5}{7}X + 4$
linear



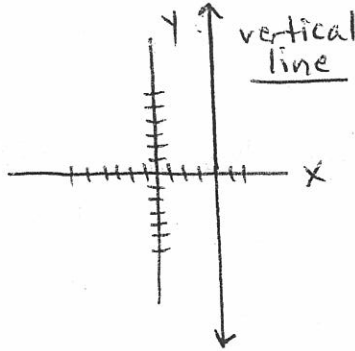
6. $\frac{(X - 3)^2}{25} + \frac{(Y + 5)^2}{9} = 1$ 273



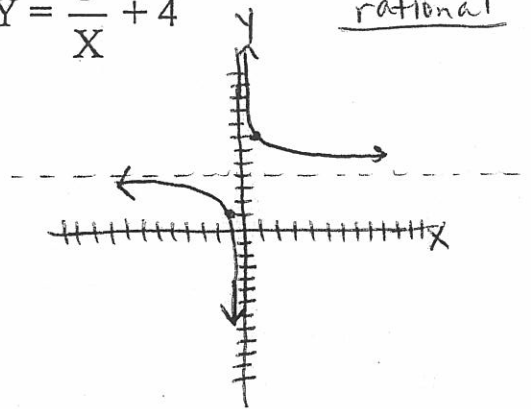
7. $Y = -5$
horizontal line



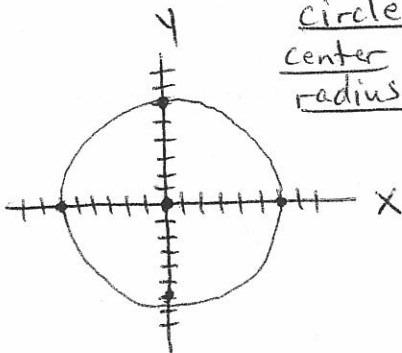
8. $X = 4$
vertical line



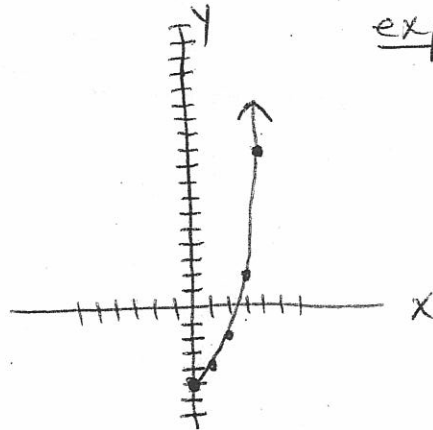
9. $Y = \frac{3}{X} + 4$
rational



10. $X^2 + Y^2 = 36$
circle
center (0, 0)
radius 6



11. $Y = 2^x + -6$
exponential



ODD ANSWERS FOR CHAPTER 10

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1. $X = 5$ or $X = -5$ 3. $X = 3$ or $X = -7$
5. $X > -5$ and $X < 5$ 7. $X \leq -4$ or $X \geq 0$

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1. $Y = 4X + 3$ 3. $Y = 2X^2 + 1$ 5. $Y = 3$

PAGE 270 -271

No Solutions Given

