

CHAPTER 10

ABSOLUTE VALUE GRAPHS AND THE CONIC SECTIONS

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|--|--------------|
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10.1 SOLVING ABSOLUTE VALUE EQUATIONS

STEPS:

see p. 88

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:

1. $|X| = 4$

$X = 4$ or $X = -4$

2. $|X + 3| + 6 = 8$

$|X + 3| = 2$

$X + 3 = 2$ or $X + 3 = -2$

$X = -1$ or $X = -5$

3. $-3|X + 7| - 2 = -14$

$-3|X + 7| = -12$

$|X + 7| = 4$

$X + 7 = 4$ or $X + 7 = -4$

$X = -3$ or $X = -11$

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. *see p. 89*

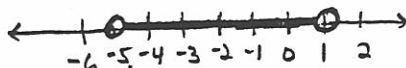
4. $4|X + 3| < 8$

$|X + 3| < 2$

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 $X + 3 < 2$

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



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

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

$|2X - 4| \geq 7$

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 $2X - 4 > 7$

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



PRACTICE:

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1. $|X| = 5$ 2. $5|X + 7| = 15$ 3. $-3|2X + 4| + 6 = -24$

Solve and then graph on a number line.

4. $|X| > 5$ 5. $|X| < 5$ 6. $4|X| + 3 \leq 11$

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

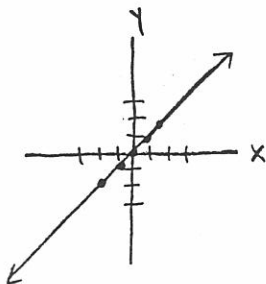
8. $5|5X + 5| + 5 < 5$

10.2 TABLES GRAPHS AND EQUATIONS

EXAMPLES:

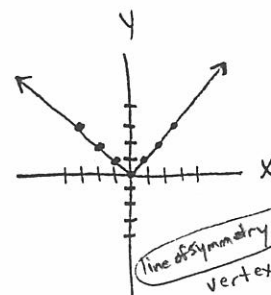
1. $Y = X$

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



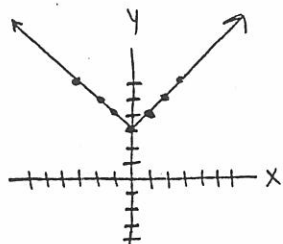
2. $Y = |X|$

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



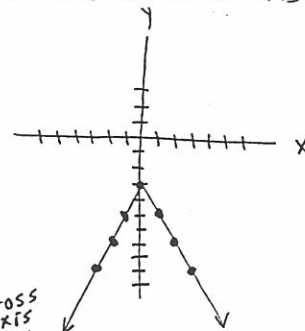
3. $Y = |X| + 3$ shifts up 3

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



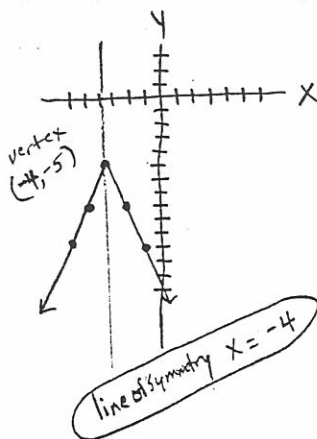
4. $Y = -2|X| - 3$ arms fold in shifts down 3

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



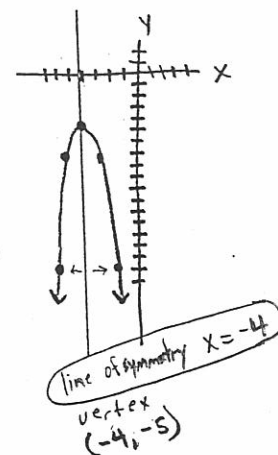
5. $Y = -3|X + 4| - 5$ reflects across x-axis shifts left 4 shifts down 5 wings fold in

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. $Y = -3(X + 4)^2 - 5$ reflects across x-axis arms fold in shifts down 5 shifts left 4

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



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

notice on absolute value

see regression rules at 1st of book

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

1. X -2 -1 0 1 2
Y -5 -1 3 7 11

2. X -2 -1 0 1 2
Y 11 8 5 8 11

3. X -2 -1 0 1 2
Y 9 3 1 3 9

4. X -2 -1 0 1 2
Y -2 -1 1 5 13

5. X -2 -1 0 1 2
Y 3 3 3 3 3

6. X -2 -2 -2 -2 -2
Y -2 -1 0 1 2

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

see
page
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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 $\frac{(X - h)^2}{a^2} - \frac{(Y - k)^2}{b^2} = 1$

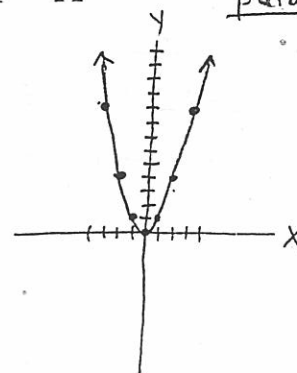
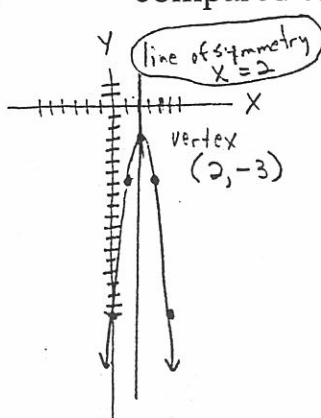
(h, k) is the center. The asymptotes have slopes
of $\pm \frac{b}{a}$. If the "X" part is positive then it opens on
the X-axis and the vertices are $(h \pm a, k)$. If the
"Y" part is positive then it opens on the Y-axis and
the vertices are $(h, k \pm b)$.

EXAMPLES:

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

compared to $Y = X^2$ parabola

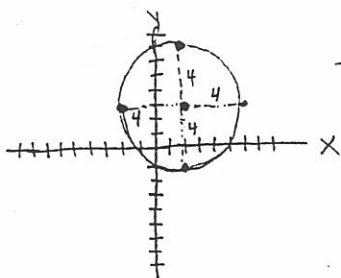
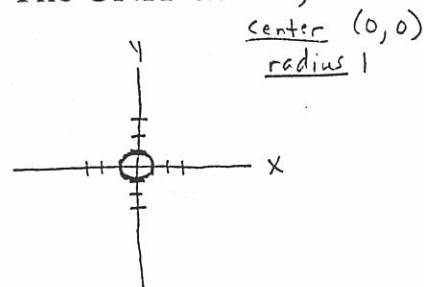
X	$-4(X-2)^2-3$	Y
-1	$-4(-1-2)^2-3$	-39
0	$-4(0-2)^2-3$	-19
1	$-4(1-2)^2-3$	-7
2	$-4(2-2)^2-3$	-3
3	$-4(3-2)^2-3$	-7
4	$-4(4-2)^2-3$	-19
5	$-4(5-2)^2-3$	-39



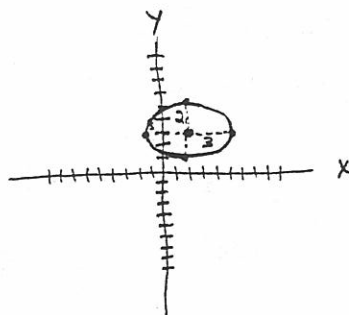
2. $(X - 2)^2 + (Y - 3)^2 = 4^2$

compared to $X^2 + Y^2 = 1$ center (2, 3) radius 4

(The UNIT circle.)

circlecenter (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 $\sqrt{4} = \pm 2$ 

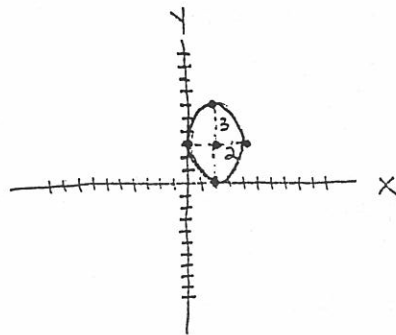
4. $\frac{(X - 2)^2}{4} + \frac{(Y - 3)^2}{9} = 1$ ellipse

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center (2, 3)

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

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

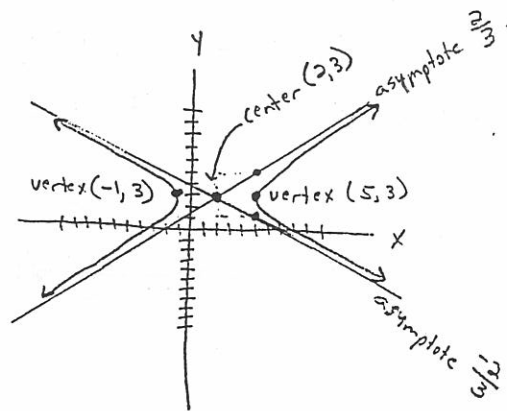


5. $\frac{(X - 2)^2}{9} - \frac{(Y - 3)^2}{4} = 1$ hyperbola

center (2, 3)

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

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

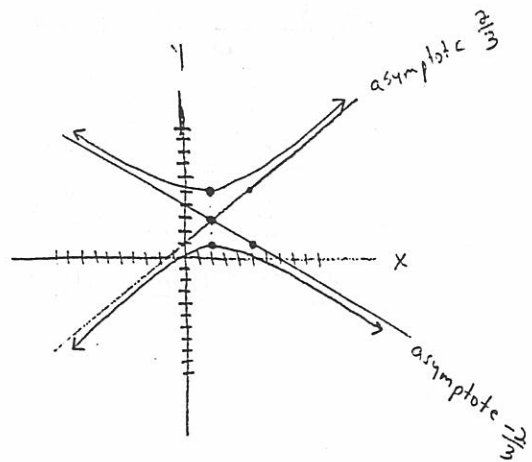


6. $-\frac{(X - 2)^2}{9} + \frac{(Y - 3)^2}{4} = 1$

center (2, 3)

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

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



PRACTICE: (Graph each.)

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1. $Y = 8$ *see p. 96 + 97*

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. $X = -3$ *see p. 96 + 97*

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

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

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

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

PRE-TEST PRACTICE AND REVIEW FOR CHAPTER 10 272

Solve and graph on a number line.

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

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

Graph each of the following on a coordinate plane.

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

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

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

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

$$7. Y = -5$$

$$8. X = 4$$

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

$$10. X^2 + Y^2 = 36$$

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

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. $Y = 3$

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No Solutions Given

