

Let's Make Our Own Parabolas!

STATION 1

$$y = ax^2$$

Directions: Complete or Grade the following worksheets in our teams. When time is up, rotate to the next station.

Objectives: By the time we leave this station, we should be sure of the following:

- (1) We understand the effects of "a" on the vertex form of the quadratic equation.
- (2) We understand why "a" effects the parabola in the way that it does.
- (3) We have verified that all the answers are complete and filled out our grade sheet (if applicable).

Key Terms:

quadratic function – A function used to create parabola

parent function – Base function before adding constants

parabola – A U shaped graph

y –intercept – The point on a graph where the line crosses the y – axis.

x –intercept –The point on a graph where the line crosses the x – axis.

axis of symmetry – The line that cuts the parabola in half.

vertex – The highest or lowest point on a parabola.

Minimum – The lowest point on a parabola.

Maximum – The highest point on a parabola.

Our Task:

Step 1: Answer the following questions using N/A when No Answer.

Step 2: Plot and label all relevant points using our colored dots on the graph paper provided at our station.

Step 3: Use wire and graph paper to model the graphs of our equations.

1) $y = x^2$

- What is the y –intercept of our parabola? (_____, _____)
- What is the x –intercept of our parabola? (_____, _____)
- What is the axis of symmetry of our parabola? $X =$ _____
- What is the vertex of our parabola? (_____, _____)
- Does our graph have a maximum or minimum?

2) $y = 2x^2$

- What is the y –intercept of our parabola? (_____, _____)
- What is the x –intercept of our parabola? (_____, _____)
- What is the axis of symmetry of our parabola? $X =$ _____
- What is the vertex of our parabola? (_____, _____)
- Does our graph have a maximum or minimum?

3) $y = 4x^2$

- What is the y –intercept of our parabola? (_____, _____)
- What is the x –intercept of our parabola? (_____, _____)
- What is the axis of symmetry of our parabola? $X =$ _____
- What is the vertex of our parabola? (_____, _____)
- Does our graph have a maximum or minimum?

4) $y = .5x^2$

- What is the y –intercept of our parabola? (_____, _____)
- What is the x –intercept of our parabola? (_____, _____)
- What is the axis of symmetry of our parabola? $X =$ _____
- What is the vertex of our parabola? (_____, _____)
- Does our graph have a maximum or minimum?

5) $y = .25x^2$

- What is the y –intercept of our parabola? (_____, _____)
- What is the x –intercept of our parabola? (_____, _____)
- What is the axis of symmetry of our parabola? $X =$ _____
- What is the vertex of our parabola? (_____, _____)
- Does our graph have a maximum or minimum?

Enter the following information into our calculator:

```
Plot1 Plot2 Plot3
\Y1 X^2
\Y2 2X^2
\Y3 4X^2
\Y4 █
\Y5 =
\Y6 =
\Y7 =
```

Notice the solid, dashed, and bold lines to left of Y1, Y2, & Y3 respectfully.

6) If we start with the parent function $y = x^2$, what happens to the parabola when we change the quadratic equation to $y=2x^2$ and $y = 4x^2$?

Enter the following information into our calculator:

```
Plot1 Plot2 Plot3
\Y1 X^2
\Y2 .5X^2
\Y3 .25X^2
\Y4 =
\Y5 =
\Y6 =
\Y7 =
```

7) If we start with the parent function $y = x^2$, what happens to the parabola when we change the quadratic equation to $y=.5x^2$ and $y=.25x^2$?

Note: We can use the letter "a" to represent any number in front of x^2 .

- 8) In general, what can we say about the effect "a" has on our parabola in the equation $y=ax^2$?
- 9) How can we explain to the class why this effect is happening during our presentation?

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STATION 2

$$y = \pm x^2$$

Directions: Complete or Grade the following worksheets in our teams. When time is up, rotate to the next station.

Objectives: By the time we leave this station, we should be sure of the following:

- (1) We understand the effects of “ \pm ” on the vertex form of the quadratic equation.
- (2) We understand why “ \pm ” effects the parabola in the way that it does.
- (3) We have verified that all the answers are complete and filled out our grade sheet (if applicable).

Key Terms:

quadratic function – A function used to create parabola

parent function – Base function before adding constants

parabola – A U shaped graph

y – intercept – The point on a graph where the line crosses the y – axis.

x – intercept – The point on a graph where the line crosses the x – axis.

axis of symmetry – The line that cuts the parabola in half.

vertex – The highest or lowest point on a parabola.

Minimum – The lowest point on a parabola.

Maximum – The highest point on a parabola.

Our Task:

Step 1: Answer the following questions using N/A when no answer.

Step 2: Plot and label all relevant points using our colored dots on the graph paper provided at our station.

Step 3: Use wire and graph paper to model the graphs of our equations.

1) $y = x^2$

- What is the y –intercept of our parabola? (_____, _____)
- What is the x –intercept of our parabola? (_____, _____)
- What is the axis of symmetry of our parabola? $X =$ _____
- What is the vertex of our parabola? (_____, _____)
- Does our graph have a maximum or minimum?

2) $y = -x^2$

- What is the y –intercept of our parabola? (_____, _____)
- What is the x –intercept of our parabola? (_____, _____)
- What is the axis of symmetry of our parabola? $X =$ _____
- What is the vertex of our parabola? (_____, _____)
- Does our graph have a maximum or minimum?

3) $y = 2x^2$

- What is the y –intercept of our parabola? (_____, _____)
- What is the x –intercept of our parabola? (_____, _____)
- What is the axis of symmetry of our parabola? $X =$ _____
- What is the vertex of our parabola? (_____, _____)
- Does our graph have a maximum or minimum?

4) $y = -2x^2$

- What is the y –intercept of our parabola? (_____, _____)
- What is the x –intercept of our parabola? (_____, _____)
- What is the axis of symmetry of our parabola? $X =$ _____
- What is the vertex of our parabola? (_____, _____)
- Does our graph have a maximum or minimum?

5) $y = .5x^2$

- What is the y –intercept of our parabola? (_____, _____)
- What is the x –intercept of our parabola? (_____, _____)
- What is the axis of symmetry of our parabola? $X =$ _____
- What is the vertex of our parabola? (_____, _____)
- Does our graph have a maximum or minimum?

Enter the following information into our calculator:

```
Plot1 Plot2 Plot3
\Y1 X^2
\Y2 -X^2
\Y3 =
\Y4 =
\Y5 =
\Y6 =
\Y7 =
```

Notice the solid and bold lines to left of Y1, Y2, & Y3 respectfully.

- 6) If we start with the parent function $y = x^2$, what happens to the parabola when we change the quadratic equation to $y = -x^2$?

Enter the following information into our calculator:

```
Plot1 Plot2 Plot3
\Y1 X^2
\Y2 2X^2
\Y3 -2X^2
\Y4 =
\Y5 =
\Y6 =
\Y7 =
```

- 7) If we start with the parent function $y = x^2$, what happens to the parabola when we change the quadratic equation to $y = 2x^2$ and $y = -2x^2$?

Note: We can use the letter "a" to represent any number in front of x^2 .

- 8) In general, what can we say about the effect " \pm " has on our parabola in the quadratic equation $y = \pm ax^2$?
- 9) How can we explain to the class why this effect is happening during our presentation?

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STATION 3

$$y = x^2 \pm k$$

Directions: Complete or Grade the following worksheets in our teams. When time is up, rotate to the next station.

Objectives: By the time we leave this station, we should be sure of the following:

- (1) We understand the effects of "k" on the vertex form of the quadratic equation.
- (2) We understand why "k" effects the parabola in the way that it does.
- (3) We have verified that all the answers are complete and filled out our grade sheet (if applicable).

Key Terms:

quadratic function – A function used to create parabola

parent function – Base function before adding constants

parabola – A U shaped graph

y –intercept – The point on a graph where the line crosses the y – axis.

x –intercept –The point on a graph where the line crosses the x – axis.

axis of symmetry – The line that cuts the parabola in half.

vertex – The highest or lowest point on a parabola.

Minimum – The lowest point on a parabola.

Maximum – The highest point on a parabola.

Our Task:

Step 1: Answer the following questions using N/A when no answer.

Step 2: Plot and label all relevant points using our colored dots on the graph paper provided at our station.

Step 3: Use wire and graph paper to model the graphs the equations.

1) $y = x^2$

- What is the y –intercept of our parabola? (_____, _____)
- What is the x –intercept of our parabola? (_____, _____)
- What is the axis of symmetry of our parabola? $X =$ _____
- What is the vertex of our parabola? (_____, _____)
- Does our graph have a maximum or minimum?

2) $y = x^2 + 4$

- What is the y –intercept of our parabola? (_____, _____)
- What is the x –intercept of our parabola? (_____, _____)
- What is the axis of symmetry of our parabola? $X =$ _____
- What is the vertex of our parabola? (_____, _____)
- Does our graph have a maximum or minimum?

3) $y = x^2 + 9$

- What is the y –intercept of our parabola? (_____, _____)
- What is the x –intercept of our parabola? (_____, _____)
- What is the axis of symmetry of our parabola? $X =$ _____
- What is the vertex of our parabola? (_____, _____)
- Does our graph have a maximum or minimum?

4) $y = x^2 - 4$

- What is the y –intercept of our parabola? (_____, _____)
- What is the x –intercept of our parabola? (_____, _____)
- What is the axis of symmetry of our parabola? $X =$ _____
- What is the vertex of our parabola? (_____, _____)
- Does our graph have a maximum or minimum?

5) $y = x^2 - 9$

- What is the y –intercept of our parabola? (_____, _____)
- What is the x –intercept of our parabola? (_____, _____)
- What is the axis of symmetry of our parabola? $X =$ _____
- What is the vertex of our parabola? (_____, _____)
- Does our graph have a maximum or minimum?

Enter the following information into our calculator:

```
Plot1 Plot2 Plot3
\Y1 [ ] X^2
-·Y2 [ ] X^2+4
\Y3 [ ] X^2+9
\Y4 =
\Y5 =
\Y6 =
\Y7 =
```

Notice the solid, dashed, and bold lines to left of Y1, Y2, & Y3 respectively.

- 6) If we start with the parent function $y = x^2$, what happens to the parabola when we change the quadratic equation to $y = x^2 + 4$ and $Y = x^2 + 9$

Enter the following information into our calculator:

```
Plot1 Plot2 Plot3
\Y1 [ ] X^2
-·Y2 [ ] X^2-4
\Y3 [ ] X^2-9
\Y4 =
\Y5 =
\Y6 =
\Y7 =
```

- 7) If we start with the parent function $y = x^2$, what happens to the parabola when we change the quadratic equation to $y = x^2 - 4$ and $y = x^2 - 9$?

Note: We can use the letter "k" to represent any number added to or subtracted from the parent function, x^2 , after it is squared.

- 8) In general, what can we say about the effect "k" has on our parabola in the quadratic equation $y = x^2 \pm k$?
- 9) How can we explain to the class why this effect is happening during our presentation?

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STATION 4

$$y = (x \pm h)^2$$

Directions: Complete or Grade the following worksheets in our teams. When time is up, rotate to the next station.

Objectives: By the time we leave this station, we should be sure of the following:

- (1) We understand the effects of "h" on the vertex form of the quadratic equation.
- (2) We understand why "h" effects the parabola in the way that it does.
- (3) We have verified that all the answers are complete and filled out our grade sheet (if applicable).

Key Terms:

quadratic function – A function used to create parabola

parent function – Base function before adding constants

parabola – A U shaped graph

y –intercept – The point on a graph where the line crosses the y – axis.

x –intercept –The point on a graph where the line crosses the x – axis.

axis of symmetry – The line that cuts the parabola in half.

vertex – The highest or lowest point on a parabola.

Minimum – The lowest point on a parabola.

Maximum – The highest point on a parabola.

Our Task:

Step 1: Answer the following questions using N/A when no answer.

Step 2: Plot and label all relevant points using our colored dots on the graph paper provided at our station.

Step 3: Use wire and graph paper to model the graphs of our equations.

1) $y = x^2$

- What is the y –intercept of our parabola? (_____, _____)
- What is the x –intercept of our parabola? (_____, _____)
- What is the axis of symmetry of our parabola? $X =$ _____
- What is the vertex of our parabola? (_____, _____)
- Does our graph have a maximum or minimum?

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

- What is the y –intercept of our parabola? (_____, _____)
- What is the x –intercept of our parabola? (_____, _____)
- What is the axis of symmetry of our parabola? $X =$ _____
- What is the vertex of our parabola? (_____, _____)
- Does our graph have a maximum or minimum?

3) $y = (x + 4)^2$

- What is the y –intercept of our parabola? (_____, _____)
- What is the x –intercept of our parabola? (_____, _____)
- What is the axis of symmetry of our parabola? $X =$ _____
- What is the vertex of our parabola? (_____, _____)
- Does our graph have a maximum or minimum?

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

- What is the y –intercept of our parabola? (_____, _____)
- What is the x –intercept of our parabola? (_____, _____)
- What is the axis of symmetry of our parabola? $X =$ _____
- What is the vertex of our parabola? (_____, _____)
- Does our graph have a maximum or minimum?

5) $y = (x - 4)^2$

- What is the y –intercept of our parabola? (_____, _____)
- What is the x –intercept of our parabola? (_____, _____)
- What is the axis of symmetry of our parabola? $X =$ _____
- What is the vertex of our parabola? (_____, _____)
- Does our graph have a maximum or minimum?

Enter the following information into our calculator:

```
Plot1 Plot2 Plot3
\Y1 X^2
\Y2 (X+2)^2
\Y3 (X+4)^2
\Y4 =
\Y5 =
\Y6 =
\Y7 =
```

Notice the solid, dashed, and bold lines to left of Y1, Y2, & Y3 respectfully.

- 6) If we start with the parent function $y = x^2$, what happens to the parabola when we change the quadratic equation to $y = (x + 2)^2$ and $y = (x + 4)^2$

Enter the following information into our calculator:

```
Plot1 Plot2 Plot3
\Y1 X^2
\Y2 (X-2)^2
\Y3 (X-4)^2
\Y4 =
\Y5 =
\Y6 =
\Y7 =
```

- 7) If we start with the parent function $y = x^2$, what happens to the parabola when we change the quadratic equation to $y = (x - 2)^2$ and $y = (x - 4)^2$?

Note: We can use the letter "h" to represent any number added to or subtracted from the parent function, x^2 , before it is squared.

- 8) In general, what can we say about the effect "h" has on our parabola in the quadratic equation $y = (x \pm h)^2$?
- 9) How can we explain to the class why this effect is happening during our presentation?