## Unit 6 Lesson 12: Graphing the Standard Form (Part 1)

### 1 Matching Graphs to Linear Equations (Warm up)

#### Student Task Statement

Graphs A, B, and C represent 3 linear equations: $y=2x+4$, $y=3−x$, and $y=3x−2$. Which graph corresponds to which equation? Explain your reasoning.



### 2 Quadratic Graphs Galore

#### Student Task Statement

Using graphing technology, graph $y=x^{2}$, and then experiment with each of the following changes to the function. Record your observations (include sketches, if helpful).

1. Adding different constant terms to $x^{2}$ (for example: $x^{2}+5$, $x^{2}+10$, $x^{2}−3$, etc.)

2. Multiplying $x^{2}$ by different positive coefficients greater than 1 (for example: $3x^{2}$, $7.5x^{2}$, etc.)

3. Multiplying $x^{2}$ by different negative coefficients less than or equal to -1 (for example: $-x^{2}$, $-4x^{2}$, etc.)

4. Multiplying $x^{2}$ by different coefficients between -1 and 1 (for example: $\frac{1}{2}x^{2}$, $-0.25x^{2}$, etc.)

### 3 What Do These Tables Reveal? (Optional)

#### Student Task Statement

* 1. Complete the table with values of $x^{2}+10$ and $x^{2}−3$ at different values of $x$. (You may also use a spreadsheet tool, if available.)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| * + $x$
 | * + -3
 | * + -2
 | * + -1
 | * + 0
 | * + 1
 | * + 2
 | * + 3
 |
| * + $x^{2}$
 | * + 9
 | * + 4
 | * + 1
 | * + 0
 | * + 1
 | * + 4
 | * + 9
 |
| * + $x^{2}+10$
 | * +
 | * +
 | * +
 | * +
 | * +
 | * +
 | * +
 |
| * + $x^{2}−3$
 |  |  |  |  |  |  |  |

* 1. Earlier, you observed the effects on the graph of adding or subtracting a constant term from $x^{2}$. Study the values in the table. Use them to explain why the graphs changed they way they did when a constant term is added or subtracted.
	2. Complete the table with values of $2x^{2}$, $\frac{1}{2}x^{2}$, and $-2x^{2}$ at different values of $x$. (You may also use a spreadsheet tool, if available.)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| * + $x$
 | * + -3
 | * + -2
 | * + -1
 | * + 0
 | * + 1
 | * + 2
 | * + 3
 |
| * + $x^{2}$
 | * + 9
 | * + 4
 | * + 1
 | * + 0
 | * + 1
 | * + 4
 | * + 9
 |
| * + $2x^{2}$
 | * +
 | * +
 | * +
 | * +
 | * +
 | * +
 | * +
 |
| * + $\frac{1}{2}x^{2}$
 |  |  |  |  |  |  |  |
| * + $-2x^{2}$
 |  |  |  |  |  |  |  |

* 1. You also observed the effects on the graph of multiplying $x^{2}$ by different coefficients. Study the values in the table. Use them to explain why the graphs changed they way they did when $x^{2}$ is multiplied by a number greater than 1, by a negative number less than or equal to -1, and by numbers between -1 and 1.

#### Activity Synthesis



### 4 Card Sort: Representations of Quadratic Functions

#### Student Task Statement

Your teacher will give your group a set of cards. Each card contains a graph or an equation.

* Take turns with your partner to sort the cards into sets so that each set contains two equations and a graph that all represent the same quadratic function.
* For each set of cards that you put together, explain to your partner how you know they belong together.
* For each set that your partner puts together, listen carefully to their explanation. If you disagree, discuss your thinking and work to reach an agreement.
* Once all the cards are sorted and discussed, record the equivalent equations, sketch the corresponding graph, and write a brief note or explanation about why the representations were grouped together.

Standard form:

Factored form:



Explanation:

Standard form:

Factored form:



Explanation:

Standard form:

Factored form:



Explanation:

Standard form:

Factored form:



Explanation:



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