

Function Challenges - 20 Questions

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Summary	Students will compete in a game to generate equations for functions that meet certain criteria, as given by the instructor.
Goals	<ol style="list-style-type: none">1. Reinforce algebraic concepts.2. Link the characteristics of a graphed function to the characteristics of the algebraic expression.3. Have fun!
Materials	Sticky Notes, Graphing Software
Duration	45 minutes
Keywords	Full Class Discussion Linear Functions Math Game Non-Linear Functions Production of Equations Production of Graphs Quadratic Functions Slope Small Group Work

Activity Plan:

1. Students will sit in groups of 2 or 3.
2. Each group will receive sticky notes.
3. Write the numbers 1 through 20 on the board in a large grid (like a calendar). Leave space in each grid box to write 5 – 10 words.
4. Each of the twenty challenges requires students to write the equations for functions that meet certain criteria (many correct answers are possible for each challenge).
5. When you are ready to play, allow the first group to choose a number from 1 to 20.

6. The instructor then reads the criteria for that challenge. Once the criteria have been read, the instructor then writes down the key points on the board in the box for that challenge.
7. All groups begin work on that challenge. (Depending on your group, you can set a time limit on their work for each challenge.)
8. Each group will write an equation on their sticky note and bring it to the instructor when done.
9. When all groups are done, functions should be tested either with graphing software or by having someone generate the graph by hand. (Geogebra is a free graphing software that can be downloaded off the Internet, if needed.) The class should discuss whether or not the function meets the criteria.
10. If correct: the group gets to post their sticky note on the board next to their group name (as activity continues, something like a bar graph of correct functions will be created).
11. If incorrect: the sticky note doesn't get posted. Depending on time and group, the teacher may want to facilitate a discussion as to how to change the function so that it would fit the criteria.
12. The next group then chooses a number that hasn't been used yet, and play continues from Step 6.
13. **Note:** You do not have to do all 20 challenges at one time. You can keep track of which ones have been used and omit those the next time you play, if you wish. Also, there are two separate rounds of 20 challenges.
14. **Note:** students may have "wait time" while other pairs are working. It could be helpful to post up a challenge problem at the board for students to think about in their spare time.

Round 1

1. Write an equation that represents a straight line that crosses the y-axis at 2.
2. Write an equation that represents a graph with constant slope that does not pass through the origin.
3. Write an equation that when graphed will pass through the point $(-5,4)$.
4. Write an equation that when graphed will show a curved line that is **not** a parabola.
5. Write an equation that represents a parabola that has a minimum value that is on the x-axis.
6. Write an equation that represents a parabola that has a minimum value that is not on the x-axis.
7. Write an equation that represents a parabola that has a maximum at $y = -5$.
8. Write an equation that when graphed will cross through the x-axis in **exactly two** different places.
9. Write two **different** equations that will intersect at the point $(0,1)$.
10. Write two **different** equations that will intersect at the point $(1,4)$.
11. Write an equation that will create a vertical line.

12. Write an equation for a parabola that will be wider, when graphed on the same plane, than the parabola $y=(1/2)x^2$.
13. Write an equation for a parabola that has a maximum at the origin and will be narrower, when graphed on the same plane, than the parabola $y=2x^2$.
14. Write one equation for a straight line and one equation for a parabola so that the graphs will **not** intersect at any points.
15. Write one equation for a straight line and one equation for a parabola so that the graphs intersect at **exactly one** point.
16. Write one equation for a straight line and one equation for a parabola so that the graphs intersect at **exactly two** points.
17. Write an equation for a line that is parallel to the line $y = -2x+6$.
18. Write an equation for a function that does not intersect the x-axis.
19. Write an equation for a function that does not intersect the y-axis.
20. Write an equation for a function that does not intersect the x-axis OR the y-axis.

Round 2

1. Write an equation for a parabola that will be wider, when graphed on the same plane, than the parabola $y=(1/2)x^2$.
2. Write an equation that when graphed will pass through the point (2, -1).
3. Sketch $y=x^5$.
4. Write an equation that represents a straight line that crosses the y-axis at 18.
5. Write an equation that represents a linear function with a slope greater than 3 that does not pass through the origin.
6. Write an equation that when graphed will pass through the point (3,1).
7. Write an equation that represents a parabola that has a minimum value that is on the y-axis.
8. Write an equation that represents a parabola that has a minimum value that is not on the y-axis.
9. Write an equation that represents a parabola that has a maximum at $y = 5$.
10. Write an equation that when graphed will cross through the x-axis in **exactly two** different places.
11. Write two **different** equations that will intersect at the point (3,2).

12. Write an equation that will intersect both the function $y=x+5$ and $y=2x+1$ at the **same point** that they both intersect.
13. Write two **different** equations that will intersect at the point $(2,5)$.
14. Write an equation for a parabola that will be wider, when graphed on the same plane, than the parabola $y=(1/8)x^2$.
15. Write an equation for a parabola that has a maximum at $y=5$ and will be wider, when graphed on the same plane, than the parabola $y=2x^2$.
16. Write one equation for a straight line and one equation that is not a straight line so that the graphs intersect at **exactly one** point.
17. Write one equation for a straight line and one equation that is not a straight line so that the graphs intersect at **exactly two** points.
18. Write one equation for a straight line and one equation that is not a straight line so that the graphs intersect at **exactly three** points.
19. Write an equation for a function that does not intersect the function $y=x$.
20. Write an equation for a function that does not intersect the function $y=8$.