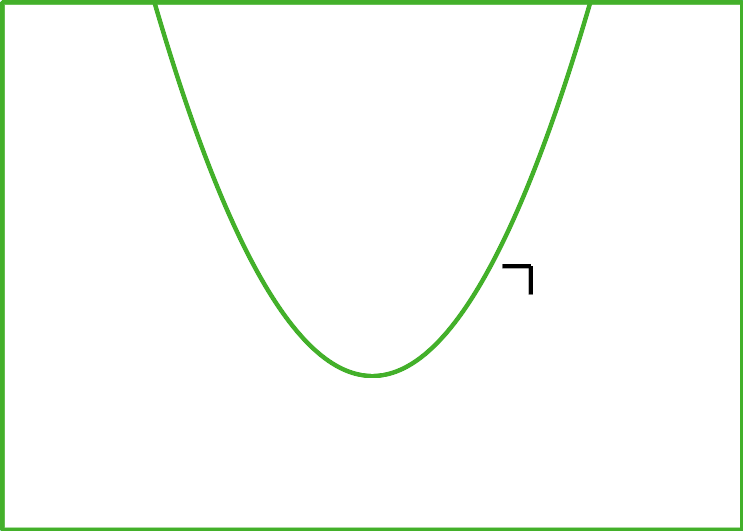
## Unit 6 Lesson 17: Changing the Vertex

### 1 Graphs of Two Functions (Warm up)

#### Student Task Statement



Here are graphs representing the functions and , given by and .

1. Which graph represents each function? Explain how you know.
2. Where does the graph of meet the -axis? Explain how you know.

### 2 Shifting the Graph

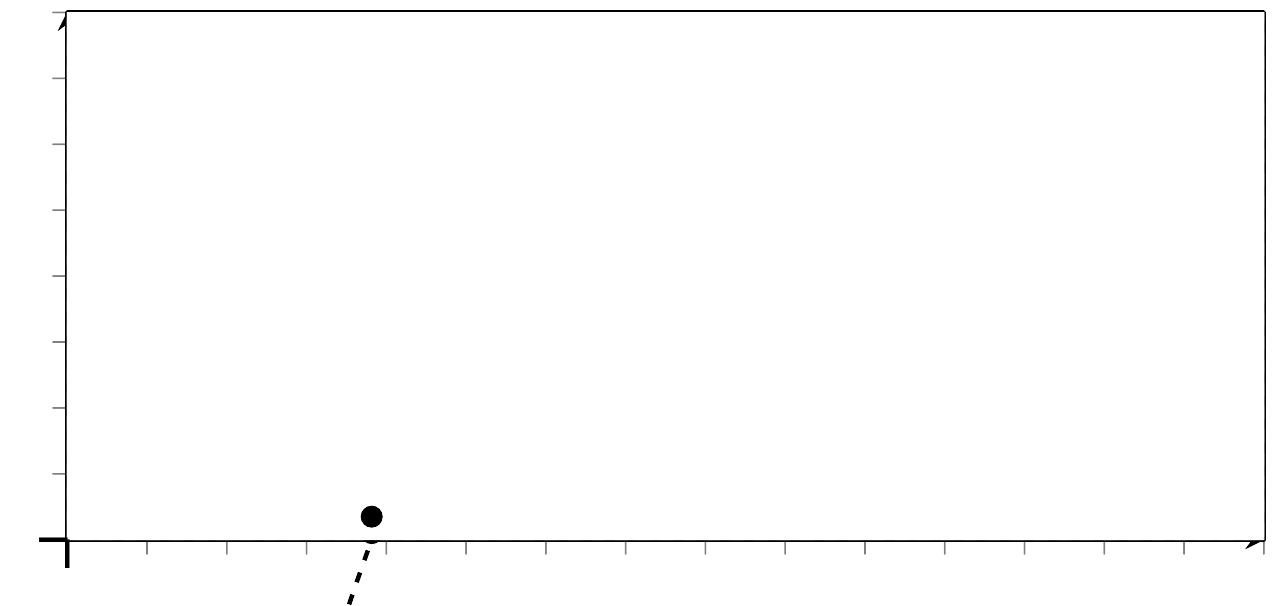
#### Student Task Statement

1. How would you change the equation so that the vertex of the graph of the new equation is located at the following coordinates and the graph opens as described?
   1. , opens up
   2. , opens up
   3. , opens down
2. Use graphing technology to verify your predictions. Adjust your equations if necessary.
3. Kiran graphed the equation and noticed that the vertex is at . He changed the equation to and saw that the graph shifted 3 units to the right and the vertex is now at .

* Next, he graphed the equation , observed that the vertex is at . Kiran thought, “If I change the squared term to , the graph will move 5 units to the right and the vertex will be at .”
* Do you agree with Kiran? Explain or show your reasoning.

### 3 A Peanut Jumping over a Wall

#### Images for Launch



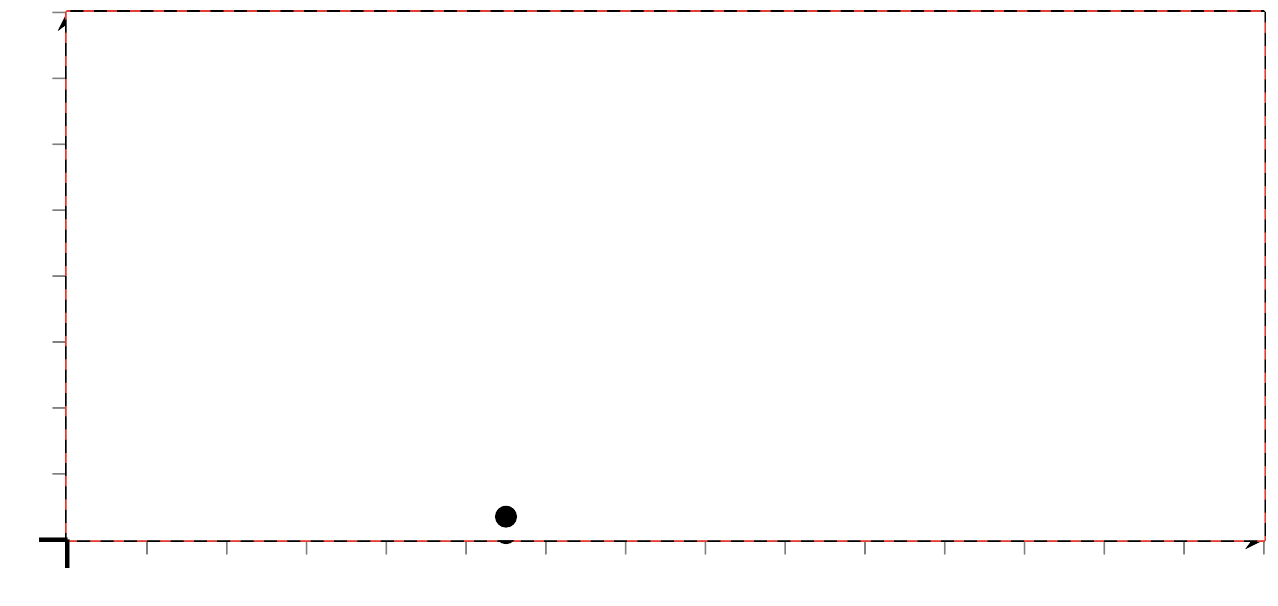
#### Student Task Statement

Mai is learning to create computer animation by programming. In one part of her animation, she uses a quadratic function to model the path of the main character, an animated peanut, jumping over a wall.



Mai uses the equation to represent the path of the jump. represents the height of the peanut as a function of the horizontal distance it travels, .

On the screen, the base of the wall is located at , with the top of the wall at . The dashed curve in the picture shows the graph of 1 equation Mai tried, where the peanut fails to make it over the wall.



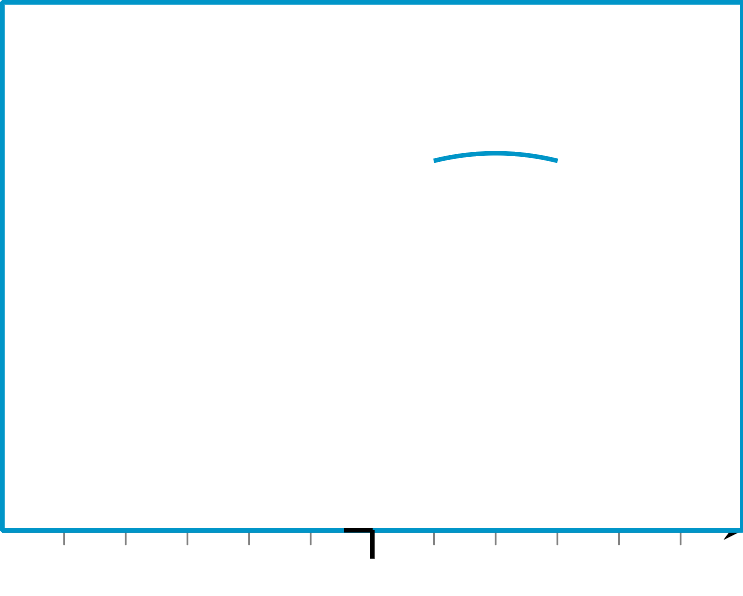
1. What are the values of and in this equation?
2. Starting with Mai’s equation, choose values for and that will guarantee the peanut stays on the screen but also makes it over the wall. Be prepared to explain your reasoning.

### 4 Smiley Face (Optional)

#### Student Task Statement

Do you see 2 “eyes” and a smiling “mouth” on the graph? The 3 arcs on the graph all represent quadratic functions that were initially defined by , but whose equations were later modified.

1. Write equations to represent each curve in the smiley face.
2. What domain is used for each function to create this graph?





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