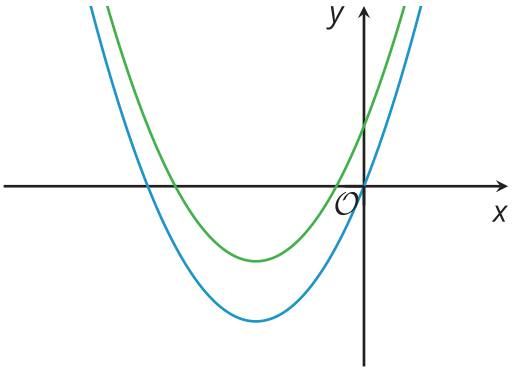
Unit 6 Lesson 17: Changing the Vertex

1 Graphs of Two Functions (Warm up)

Student Task Statement



Here are graphs representing the functions f and g, given by $f(x) = x(x + 6)$ and $g(x) = x(x + 6) + 4$.

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

2 Shifting the Graph

Student Task Statement

1. How would you change the equation $y = x^2$ so that the vertex of the graph of the new equation is located at the following coordinates and the graph opens as described?
   a. $(0, 11)$, opens up

   b. $(7, 11)$, opens up

   c. $(7, -3)$, opens down

2. Use graphing technology to verify your predictions. Adjust your equations if necessary.

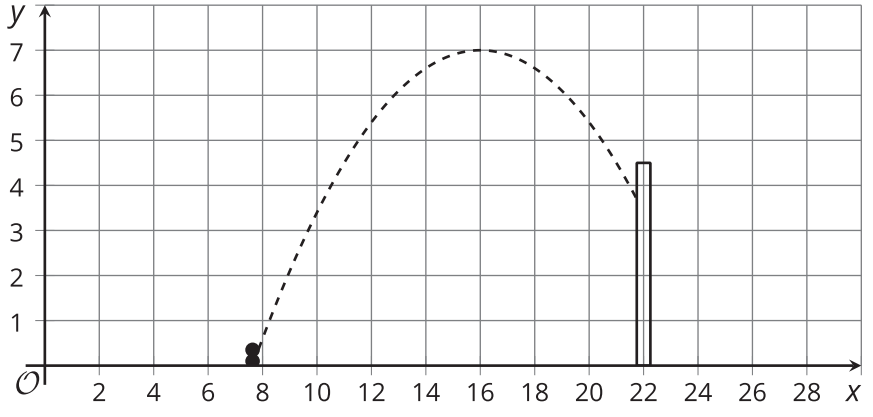
3. Kiran graphed the equation $y = x^2 + 1$ and noticed that the vertex is at $(0, 1)$. He changed the equation to $y = (x - 3)^2 + 1$ and saw that the graph shifted 3 units to the right and the vertex is now at $(3, 1)$.

   Next, he graphed the equation $y = x^2 + 2x + 1$, observed that the vertex is at $(-1, 0)$. Kiran thought, "If I change the squared term x^2 to $(x - 5)^2$, the graph will move 5 units to the right and the vertex will be at $(4, 0)$."

   Do you agree with Kiran? Explain or show your reasoning.

3 A Peanut Jumping over a Wall

Images for Launch

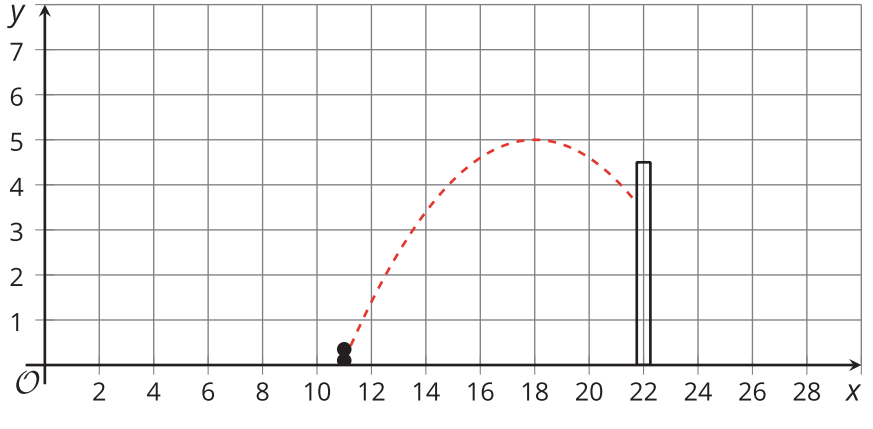


Student Task Statement

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 $y = -0.1(x - h)^2 + k$ to represent the path of the jump. y represents the height of the peanut as a function of the horizontal distance it travels, x.

On the screen, the base of the wall is located at $(22, 0)$, with the top of the wall at $(22, 4.5)$. 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 h and k in this equation?

2. Starting with Mai's equation, choose values for h and k 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 $y = x^2$, 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?