Name _____ Date _____

The Form Is "Key"

Vertex Form of a Quadratic Function

1. A concert venue can hold up to 20,000 people. The concert will sell out if tickets are sold for $40 a piece. In order to make more money, the venue would like to increase the ticket price. They determine that for every one dollar increase in price, 200 fewer people will attend. If x represents the number of one dollar increases in the price, then the revenue that the concert will bring in is represented by the function $R(x) = (20{,}000 - 200x)(40 + x)$.

a. Rewrite this function in the correct factored form. Then state the key characteristics you can determine from the equation and what they mean in terms of the problem situation.

b. Determine the vertex for the function. Explain what it means in terms of the problem situation. Then use it to rewrite the function in vertex form.

c. Determine the y-intercept for the function. Explain what it means in terms of the problem situation.

d. Which of the following functions must be the revenue function written in standard form? Explain your reasoning.

$R(x) = -200x^2 + 12{,}000x - 800{,}000$ or $R(x) = -200x^2 + 12{,}000x + 800{,}000$

2. Perez throws a softball up in the air. The height of the ball in meters can be determined by the function $h(t) = -4.9(t - 3)^2 + 60$, where t is the time it is in the air in seconds.

   a. Identify the form of this quadratic function. Then state all you know about the key characteristics, based only on the given equation of the function. Explain what they mean in terms of the problem situation.

   b. Determine the x-intercept(s) of the function. Explain what they mean in terms of the problem situation. Then, write the function in factored form.

   c. Use your graphing calculator to determine the y-intercept for the function. Explain what it means in terms of the problem situation.

   d. Which of the following functions must be the revenue function written in standard form? Explain your reasoning.

   $h(t) = -4.9t^2 + 29.4t + 15.9$ or $h(t) = -4.9t^2 + 29.4t - 15.9$

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3. A company knows that the more it advertises the more product it will sell. However, advertising more will also cost more money, which then takes away some of the profit. The profit will therefore follow the path of a parabola, because it will increase from more advertising but eventually decrease if too much money is spent on advertising. The profit (in thousands of dollars) can be represented by the function $P(x) = -2x^2 + 14x + 60$, where x represents the amount of money spent (in thousands of dollars).

a. Identify the form of this quadratic function. Then state all you know about the key characteristics, based only on the given equation of the function. Explain what they mean in terms of the problem situation.

b. Determine the x-intercept(s) of the function. Explain what they mean in terms of the problem situation. Then, write the function in factored form.

c. Determine the vertex of the function. Explain what it means in terms of the problem situation. Then write the function in vertex form.