Assignment: Find Maximum and Minimum

Choose any three (3) of the following five problems to solve. Be sure to show all your work.

1. A video game designer decides to include a character in a new game that only moves along a parabolic path. The designer uses the function $y = -x^2 + 50x + 10$ to model this character's path, where y is the height of the character in pixels and x is the time in seconds that it takes the character to move across one parabolic path.

   a. Is the vertex of the function a maximum or minimum point and how can you tell?

   b. Find the x-coordinate of the vertex. Show all work leading to your answer and write the answer in simplest form.

   c. Find the y-coordinate of the vertex. Show all work leading to your answer and write the answer in simplest form.

   d. Write the vertex as an ordered pair (x, y). What does the vertex represent for this situation? Write 1-2 sentences to explain your answer.

2. A satellite dish has the shape of a parabola, the U-shaped graph of a quadratic function. Suppose an engineer has determined that the shape of one of the satellite dishes offered by the company can be modeled by the quadratic function $y = \frac{2}{27}x^2 - \frac{4}{3}x$, where y is the vertical depth of the satellite dish in inches and x is the horizontal width in inches.

   a. Is the vertex of the function a maximum or minimum point and how can you tell?

   b. Find the x-coordinate of the vertex. Show all work leading to your answer and write the answer in simplest form.

   c. Find the y-coordinate of the vertex. Show all work leading to your answer and write the answer in simplest form.

d. Write the vertex as an ordered pair (*x*, *y*). What does the vertex represent for this situation? Write 1-2 sentences to explain your answer.

3. Suppose an investor builds a stock portfolio with a variety of shares in various high tech companies. The value of the stock portfolio is modeled by the function $y = 2x^2 - 20x + 100$, where *y* is the value of the portfolio in hundreds of dollars and *x* is the time in months.

   a. Is the vertex of the function a maximum or minimum point and how can you tell?

   b. Find the *x*-coordinate of the vertex. Show all work leading to your answer and write the answer in simplest form.

   c. Find the *y*-coordinate of the vertex. Show all work leading to your answer and write the answer in simplest form.

   d. Write the vertex as an ordered pair (*x*, *y*). What does the vertex represent for this situation? Write 1-2 sentences to explain your answer.

4. Jared hits a golf ball off the tee. The height of the ball can be modeled by the quadratic function $y = -0.0032x^2 + 0.8x$, where *y* is the golf ball's height in yards above the ground and *x* is the horizontal distance from the tee in yards.

   a. Is the vertex of the function a maximum or minimum point and how can you tell?

   b. Find the *x*-coordinate of the vertex. Show all work leading to your answer and write the answer in simplest form.

c. Find the *y*-coordinate of the vertex. Show all work leading to your answer and write the answer in simplest form.

d. Write the vertex as an ordered pair (*x*, *y*). What does the vertex represent for this situation? Write 1-2 sentences to explain your answer.

5. A surfboard manufacturer earns a weekly profit of *y* dollars by selling *x* custom-made surfboards, according to the quadratic function $y = -4x^2 + 232x$.

   a. Is the vertex of the function a maximum or minimum point and how can you tell?

   b. Find the *x*-coordinate of the vertex. Show all work leading to your answer and write the answer in simplest form.

   c. Find the *y*-coordinate of the vertex. Show all work leading to your answer and write the answer in simplest form.

   d. Write the vertex as an ordered pair (*x*, *y*). What does the vertex represent for this situation? Write 1-2 sentences to explain your answer.