$\qquad$

## I. Writing Quadratic Functions in Vertex Form

State the quadratic function in vertex form and identify the vertex.

1. $f(x)=x^{2}+24 x+145$
2. $g(x)=3 x^{2}-18 x+7$
3. $h(x)=2 x^{2}+14 x-3$

## II. Choose a function above to graph and state the information requested.

## Function:

Transformations:

Domain:

Range:
x-int:
y-int:

Vertex:

Axis of Symmetry:


## III. Linear Regression

1. 

| x | 12 | 25 | 36 | 50 | 64 |
| :---: | :---: | :---: | :---: | :---: | :---: |
| y | 100 | 75 | 52 | 26 | 9 |

a) Sketch a scatter plot of the data. b) Find the regression line for this data.
b) Estimate y , when $\mathrm{x}=20$.
2. AGE and SYSTOLIC BLOOD PRESSURE: The table below shows the age and systolic blood pressure for a group of people who recently donated blood.

| Age | 35 | 24 | 48 | 50 | 34 | 55 | 30 | 26 | 41 | 37 |
| :--- | :---: | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| Blood <br> Pressure | 128 | 108 | 140 | 135 | 119 | 146 | 132 | 104 | 132 | 121 |

a) Find the regression line for this data.
b) Based on the regression equation, predict the blood pressure of a 15 year old; of a 60 year old:
c) Predict the age of a person with a blood pressure of 130 .

## IV. Quadratic Applications

Find the requested information for each problem. Round all answers to three decimal places.
Motion Problem Formulas: $\quad h=-16 t^{2}+v_{0} t+h_{0}$ (feet) $\quad h=-4.9 t^{2}+v_{0} t+h_{0}$ (meters)

1. From ground level, a ball is thrown upward with an initial velocity of $83.3 \mathrm{~m} / \mathrm{s}$.
a. Write an equation for the height of the ball as a function of time. $\qquad$
b. Draw and label a picture. Include the window you used.
c. When will the ball hit the ground? $\qquad$
d. When does the ball reach the maximum height? $\qquad$
e. What is the maximum height of the ball? $\qquad$
d. When will the ball reach a height of 294 meters on its way up? $\qquad$
2. A sheet of metal is to be cut into a rectangular shape so that the width of the sheet metal is 6 ft less than the length.
a) Sketch a picture of the sheet metal and label its dimensions
b) Write an equation for the area of the sheet metal as a function of the length.
c) If the maximum area of the sheet is to be 216 sq ft , what are the dimensions of the sheet? (Show work)
3) A rocket is launched from ground level with an initial velocity of $224 \mathrm{ft} / \mathrm{s}$.

The equation for this problem is $h=-16 t^{2}+224 t$ and the graph is sketched to the right.
a) When does the rocket hit the ground?
b) What is the maximum height of the rocket?
(Find this algebraically - SHOW YOUR WORK)

4. A rectangular pool 60 ft long by 40 ft wide is surrounded by a walk of uniform width. The area of the walk is found using the equation: $A=(2 x+40)(2 x+60)-2400$ where " $x$ " represents the width of the walk.
a) If the total area of the walk is 416 square feet, what is the width of the walk? $\qquad$
(Hint: you may use your calculator here.)
b) Explain in complete sentences how you got your answer to part a.

## V. Quadratic Regression

1. The following data was collected for the braking distance of an automobile at various speeds under normal driving conditions.

| Speed (m/hr) | 10 | 16 | 22 | 29 | 33 | 40 | 55 | 70 |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Distance | 19 | 30 | 41 | 66 | 83 | 116 | 215 | 343 |

a. Find the quadratic regression of best fit.
b. Predict the braking distance for a vehicle going 48 miles per hour. $\qquad$
c. If the distance traveled is 450 feet from the time the brakes are applied, then what was the speed of the car at the time the brakes were applied?

