**Fireworks**

The Jefferson High junior varsity soccer team has just won the championship. To celebrate this triumph, the school will be putting on a fireworks display, and the team members are helping with the planning.

The fireworks will use rockets launched from the top of a tower near the school. The top of the tower is 160 feet off the ground. The mechanism will launch the rockets so that they are initially rising at 92 feet per second.

The team members want the fireworks from each rocket to explode when the rocket is at the top of its trajectory. They need to know how long it will take for the rocket to reach the top, so that they can set the timing mechanism. Also, in order to inform spectators of the best place to stand to see the display, they need to know how high the rockets will go.

The rockets will be aimed toward an empty field and shot at an angle of 65 degrees above the horizontal. The team members want to know how far the rockets will land from the base of the tower so they can fence off the area in advance. (Note: The field where the rockets will land is at the same level as the base of the tower.)

*Some Formulas*

Antonio is on the soccer team. His sister Hilda is a senior. She says she learned some physics and mathematics that would be helpful to Antonio’s team.

She says that there is a function *h*(*t*) that will give the rocket’s height off the ground in terms of the time *t* elapsed since launch. Specifically, if *t* is in seconds and *h*(*t*) is in feet, then

*h*(*t*) = 160 + 92*t* - 16*t*2

 (You can probably see where the numbers 160 and 92 come from. The coefficient -16 in the term -16*t*2 has to do with the force of gravity.)

Hilda also says that the team can find the horizontal distance the rocket travels with this function:

*d*(*t*) = 92*t* / tan 65°

Again, *t* is the number of seconds since the rocket was launched, and *d*(*t*) is the distance in feet.

But that was all the information Hilda would give the soccer team. See whether you can help the soccer team find the answers to its questions.

1. Draw a sketch of the situation.
2. Write a clear statement of the questions the soccer team wants answered.
3. Describe how you might use Hilda’s functions to help answer the questions you stated in Question 2.
4. Using whatever methods you choose, try to get some answers (or partial answers) to the questions you stated in Question 2.