3. [11 points] The UM Dance Club met up with the UM Math Modeling Club to write formulas for different dancer's jumps. They measure one dancer's total time in the air as 1 second and their maximum height as 4 feet. They know that the function $D(t)$ which gives the dancer's height (in feet) as a function of time after they jump (in seconds) is a quadratic function.

a. [3 points] One member of the Math Modeling Club wants to find the formula for $D(t)$ using the zeros of the function, so is starting with the form:

$$D(t) = a(t - r)(t - s)$$

To model the dancer's jump described above, what are possible values of r and s and how do you know?

$r =$ _____

$s =$ _____

Explanation:

b. [3 points] Another member of the Math Modeling Club wants to write a formula using vertex form of a quadratic function:

$$D(t) = a(t - h)^2 + k$$

To model the dancer's jump described above, what are the values of h and k in this formula and how do you know?

$h =$ _____

$k =$ _____

Explanation:

The UM Dance Club met up with the UM Math Modeling Club to write formulas for different dancer's jumps. They measure one dancer's total time in the air as 1 second and their maximum height as 4 feet. They know that the function $D(t)$ which gives the dancer's height (in feet) as a function of time after they jump (in seconds) is a quadratic function.

c. [3 points] Find the exact value of a in the formulas above. *You can use either of your equations to do this. Show all work.*

$a =$_____

d. [2 points] From the context of the problem alone—without relying on or referring to your calculation above—would you expect the value of a to be positive or negative? Why?

$a > 0$ $a < 0$ NOT ENOUGH INFORMATION

Explanation: