9.1 Investigation: Rocket Science
Algebra 1

Name: _____

A model rocket blasts off and its engine shuts down when it is 98 m above the ground. Assume that it travels straight up and that the only force acting on it is the downward pull of gravity. In the metric system, the acceleration due to gravity is 9.8 m/s^2. The quadratic function $h(t)=\frac{1}{2}(-9.8)t^2+39.2t+98$ describes the rocket's **projectile motion.**

Step 1: Define the function variables and their units of measure for this situation.

$t \sim x \rightarrow$ time (s) $\quad h(t) \sim y \rightarrow$ height (m)

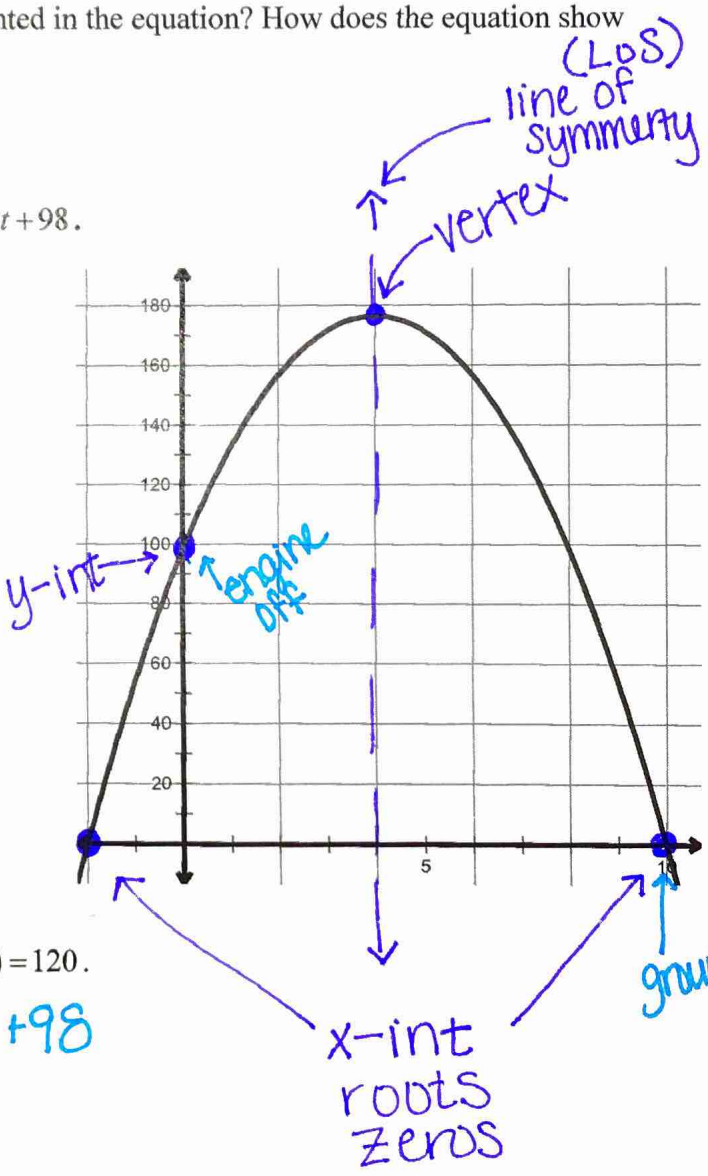
Step 2: What is the real-world meaning of $h(0)=98$?

$t=0$
$h(t)=98$ engine shuts down

Step 3: How is the acceleration due to gravity, or g, represented in the equation? How does the equation show that this force is *downward*?

↓
negative

The graph to the right represents $h(t)=\frac{1}{2}(-9.8)t^2+39.2t+98$.



Step 4: How high does the rocket fly before falling back to Earth? When does it reach this point?

175 m
4 s → vertex (max)

Step 5: How much time passes while the rocket is in flight, after the engine shuts down?

10 sec

Step 6: What domain and range values make sense in this situation?

D: [0, 10]
R: [0, 175]

Step 7: Write the equation you must solve to find when $h(t)=120$.

$120=\frac{1}{2}(-9.8)t^2+39.2t+98$

Step 8: What is the real world meaning of $h(t)=120$?

at what time is the rocket @ 120 m (height)