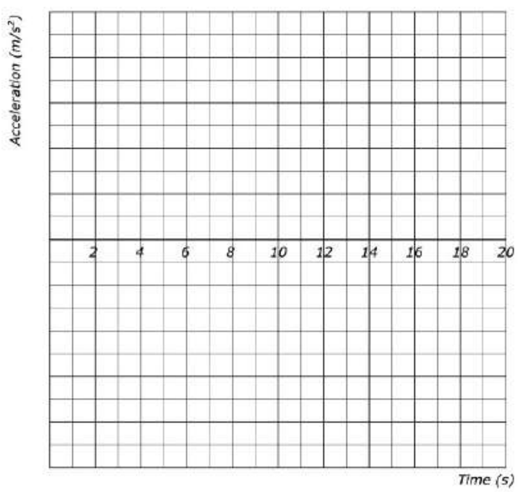
NAME ____________________ DATE ____________

Scenario

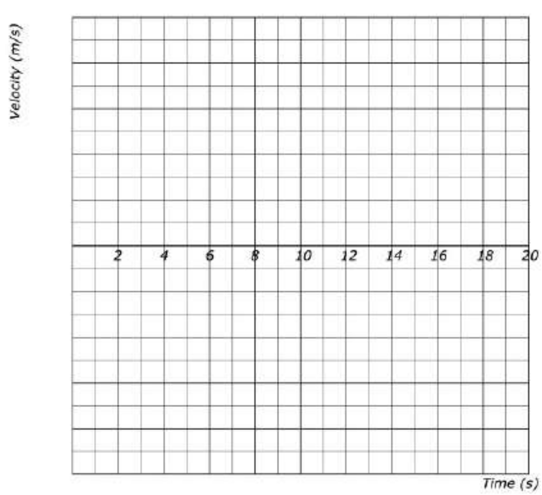
A rocket fires its engines to launch straight up from rest with an upward acceleration of 5 m/s^2 *for* 10 *seconds. After this time, the engine shuts off and the rocket freely falls straight down back to Earth's surface.*

Using Representations

PART A: Draw a graph of the acceleration as a function of time from $t = 0$ seconds to $t = 20$ seconds.



PART B: Draw a graph of the velocity as a function of time from $t = 0$ seconds to $t = 20$ seconds.



Quantitative Analysis

PART C: Using the kinematics equation $y = y_0 + v_{y0}t + \frac{1}{2}a_y t^2$, a classmate writes out the following solution to find the time when the rocket lands back on Earth. Explain in one sentence, using terms such as *acceleration, velocity, position, constant, changin*g, and *zero*, why the solution below is incorrect.

$$y = y_0 + v_{y0}t + \tfrac{1}{2}a_y t^2$$

$$0 = 0 + \left(0\,\tfrac{m}{s}\right)t + \tfrac{1}{2}\left(5\,\tfrac{m}{s^2}\right)t^2$$

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Argumentation

PART D: From your velocity vs. time graph in Part B, determine the time when the rocket reaches its maximum height.

Time for the rocket to reach its maximum height = ____________

Explain how you determined your answer.

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PART E: Make a claim about the numerical value of the rocket's maximum height.

The rocket's maximum height is equal to ________

Evidence: What physical feature of the velocity vs. time graph supports your claim?

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