NAME: _____

Car Darts and Parabolas

You are working as a stunt coordinator for a TV Show called "Top Gear". One of the episodes involves a game of "car darts" where driverless cars are launched over a cliff using a nitrogen canon and ramp. Before setting up the stunt, you want to simulate the situation and model the situation mathematically in the computer…

A car will be launched at a 40 degree angle at a speed of 20 m/second over a cliff which is 15 meters tall.

PART 1.

A. Sketch a picture of the situation.

B. Run a simulation of the situation using https://phet.colorado.edu/en/simulation/projectile-motion

PART 2.

A. Collect data points (time, height) from the simulation that will be helpful in determining a quadratic regression.

B. Model the path of the launched car as a quadratic function identified as f(t) where t represents time and f(t) represents height.

C. Graph f(t) using a graphing calculator.
Identify the Xmin, Xscl, Ymin, Yscl

D. At what time, will the car reach its highest point?

E. At what time, will the car hit the ground?

F. Using 2 of 3 methods, determine the height of the car after 3 seconds of being launched?
Method 1: Algebraically Method 2: Graphically Method 3: Simulator

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PART 3

A. Collect data points that will be helpful in determining a quadratic regression, written as a function, identified as h(x), where x represents horizontal distance and h(x) represents vertical distance.

B. Write the function identified as h(x), for the path of the car launched from the top of the cliff.

B. Graph h(x) using a graphing calculator.
Identify the Xmin, Xscl, Ymin, Yscl

C. How high does the car reach?

D. How high above the cliff does the car reach?

E. How far will the car travel?

F. A target is painted on the ground, 40 meters from the base of the cliff. How far from the target does the simulated car land?

G. What change(s) could be made to the stunt set up so that the car will land on the desired target?