

The Bumpy Ramp Problem (Dynamics of an Accelerating Vehicle with Regular Obstructions)

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Describing motion of a vehicle in one-dimension (1D) is a common situation used to teach motion in general physics. It requires the understanding of the kinematic variables and differential relationships between displacement, velocity, acceleration, and time. In teaching general physics, there are not too many variations on 1D motion problems, and one also finds that it can be surprisingly easy to complicate a problem to the point where it is no longer



tractable. On the 2016 Advanced Placement (AP) Physics 1 Exam, a variation to the 1D motion question was asked about a vehicle going down an inclined plane with regular bumps. This engendered many comments because it turns out the question may not easily be answered with the physics learned by a first-year student. We propose to study this problem with computational and physical models to determine the motion of a car on a bumpy ramp.

