

**ZMATH 2016d.00878**

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**Mathematical design of a highway exit curve.**

Int. J. Math. Educ. Sci. Technol. 47, No. 1, 132-139 (2016).

Summary: A highway exit curve is designed under the assumption that the tangential and normal components of the acceleration of the vehicle remain constant throughout the path. Using fundamental principles of physics and calculus, the differential equation determining the curve function is derived. The equation and initial conditions are cast into a dimensionless form first for universality of the results. It is found that the curves are effected by only one dimensionless parameter which is the ratio of the tangential acceleration to the normal acceleration. For no tangential acceleration, the equation can be solved analytically yielding a circular arc solution as expected. For nonzero tangential acceleration, the function is complicated and no closed-form solutions exist for the differential equation. The equation is solved numerically for various acceleration ratios. Discussions for applications to highway exits are given.

*Classification:* M55 I75 N45

*Keywords:* kinematics of motion; calculus; curve design; highway exit

doi:10.1080/0020739X.2015.1044045