PROBLEM SOLVING

EXAMPLE 6 on p. 927 for Exs. 39–41

39. RATE OF CHANGE In calculus, it can be shown that the rate of change of the function $f(x) = \sec x + \cos x$ is given by this expression:

$$\sec x \tan x - \sin x$$

Show that the expression for the rate of change can be written as $\sin x \tan^2 x$.

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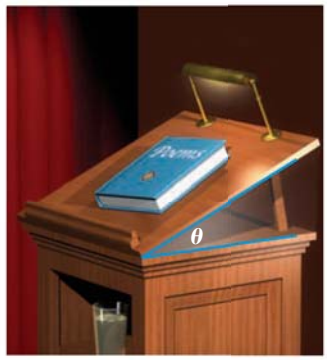
40. PHYSICAL SCIENCE Static friction is the amount of force necessary to keep a stationary object on a flat surface from moving. Suppose a book weighing W pounds is lying on a ramp inclined at an angle θ. The coefficient of static friction u for the book can be found using this equation:

$$uW \cos \theta = W \sin \theta$$



a. Solve the equation for u and simplify the result.

b. Use the equation from part (a) to determine what happens to the value of u as the angle θ increases from 0° to 90°.

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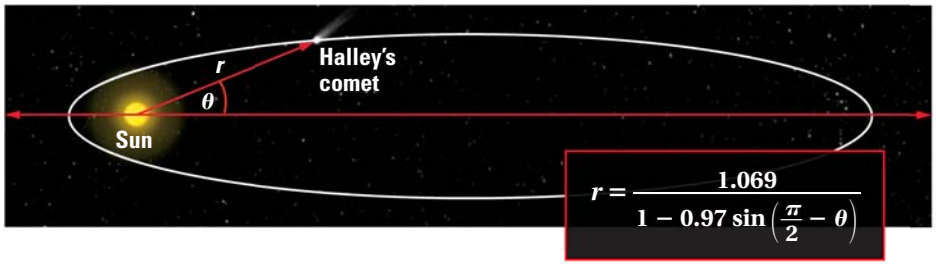
41. MULTIPLE REPRESENTATIONS The path of Halley's comet is an ellipse with the sun as a focus. The path can be estimated by the equation below, where r is the comet's distance (in astronomical units) from the sun and θ is the angle (in radians) between the horizontal major axis and the comet.



a. Writing an Equation Simplify the equation given above.

b. Drawing a Graph Use a graphing calculator to graph the equation from part (a).

c. Making a Table Make a table of values for the equation from part (a) in which θ starts at 0 and increases in increments of $\frac{\pi}{4}$. Use the table to approximate the closest and farthest distance, in miles, Halley's comet is from the sun. (*Note:* 1 astronomical unit ≈ 93 million miles.)

42. TAKS REASONING Use a reciprocal identity to describe what happens to the value of $\sec \theta$ as the value of $\cos \theta$ increases. On what intervals does this happen?

43. TAKS REASONING Use the tangent identity to describe what happens to the value of $\tan \theta$ as the value of $\sin \theta$ increases and the value of $\cos \theta$ decreases. On what intervals does this happen?