

The Durango Curve Problem

When driving south on I-17 in Phoenix, Arizona you will arrive at a place where the freeway makes a 90 degree turn to the east. This location is known as "The Durango Curve."

Along both sides of the freeway are cement barriers approximately three feet high. If you are driving south in mid-morning when the sun is at 45 degrees, the east side barrier casts a shadow on the freeway that is three feet long. Then, as you drive around the curve, this shadow gradually gets smaller and eventually disappears as shown in Figure 1.

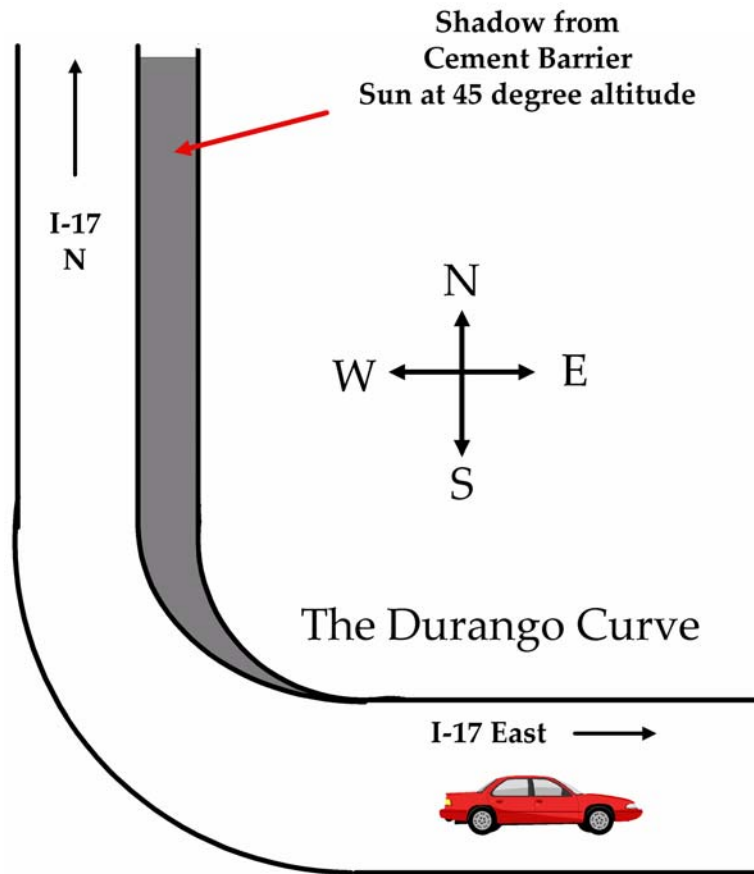


Figure 1 Overview

The equation that describes the Durango Curve itself is pretty simple because it is a quadrant of a circle.

$$(x - h)^2 + (y - k)^2 = r^2$$

But, What is the equation describing the shadow throughout the turn? I'm looking for a general equation, not just for when the sun is at 45 degrees.

What a simple yet interesting problem!