Problem Definition

Problem 43. **Velocity and Acceleration** The velocity (in feet per second) of and automobile starting from rest is modeled by

$$\frac{ds}{dt} = \frac{90t}{t+10}$$

Create a table showing the velocity and acceleration at 10 second intervals during the first minute of travel? What can you conclude?

Solution Step 1:

The acceleration is found by computing the second derivative of the position variable, s, or the first derivative of the velocity with respect to t. The acceleration is given by

$$\begin{aligned}\frac{d^2s}{dt^2} &= \frac{d}{dt}\frac{90t}{t+10} \\ &= \frac{90(t+10)-90t(1)}{(t+10)^2} \\ &= \frac{900}{(t+10)^2}\end{aligned}$$

We will use the given velocity and this function to fill in the table.

Solution Step 2:

Using $\frac{ds}{dt}$ and $\frac{d^2s}{dt^2}$ the following table can be filled in.

t	0	10	20	30	40	50	60
$s'(t)$	0	45	60	67.5	72	75	77.1
$s''(t)$	10	2.25	1	0.56	0.36	0.25	0.18

The interpretation is that the velocity is increasing. However, the acceleration is tending to zero. So, the car is approaching some crusing velocity.