PROBLEM OF THE MONTH #1

SEPTEMBER 2016

Open to all students whose mathematics classes come solely from the following list: Math 92, Math 105, Math 151, Math 161, Math 162, Math 163, Math 165, Math 177, Math 287, Math 185, Math 241, or Math 277 or their equivalent.

Directions: Write a complete solution to the problem below showing all work. Your paper must have your name, W#, and Southeastern email address. Solutions are to be placed in the envelope for Problem #1 located in the Department of Mathematics Office, Fayard 308 by 4:30 p.m., **Thursday, September 29**. No late papers will be accepted.

All papers with a correct solution will be entered in a drawing for a great prize!

Questions concerning the problem of the month should be sent to either Dr. Tilak de Alwis (tdealwis@selu.edu), or Dr. Randy Wills (rwills@selu.edu)

PROBLEM:

Two friends, Sarah and Brad decide to race around a baseball diamond which is a square with sides equal to 90 feet each. Both Sarah and Brad start at home plate. Sarah runs counterclockwise around the baseball diamond, and Brad runs clockwise around the baseball diamond.

Sarah's distance in feet, $t - seconds$ after she starts running from home plate is given by
$$D_{Sarah}(t) = \left(\frac{15}{14}t^2 + \frac{75}{7}t\right) \; feet.$$
Sarah's velocity in feet/second, $t - seconds$ after she starts running from home plate is given by
$$V_{Sarah}(t) = \left(\frac{15}{7}t + \frac{75}{7}\right) \frac{feet}{second}.$$
Brad's distance in feet, $t - seconds$ after he starts running from home plate is given by
$$D_{Brad}(t) = \frac{120}{267.007}(t^3 - 20t^2 + 140t) \; feet.$$
Brad's velocity in feet/second, $t - seconds$ after he starts running from home plate is given by
$$V_{Brad}(t) = \frac{120}{267.007}(3t^2 - 40t + 140) \frac{feet}{second}.$$

a) After how many seconds do Sarah and Brad meet? Give the approximate answer rounded to 2 decimal places. Hint: When they meet, the sum of their respective distances from home plate is equal to $360 \; feet$.

b) Determine who wins the race by finding the time it takes each of them to run completely around the baseball diamond. Give each time rounded to 2 decimal places if needed.

c) What are the velocities of Sarah and Brad as they cross home plate? Give the approximate velocities for both Sarah and Brad expressed in both $\frac{feet}{second}$ and $\frac{miles}{hour}$. Hint: $60\frac{miles}{hour} = 88\frac{feet}{second}$.