Assignment #12

Due on Wednesday, November 14, 2012

Read Section 5.4, *Interpretations of the Riemann Integral,* in the class lecture notes at `http://pages.pomona.edu/~ajr04747/`

Do the following problems

1. The speed of an object moving in a straight line, and starting from rest, increases from 0 to 25 m/sec at a constant rate for five seconds. The speed remains at 25 m/sec for 25 seconds, and then decreases again to 0 at a constant rate in 30 seconds.

   (a) Give a formula for computing the position of the object, $s(t)$, at any time t in seconds,given that $s(0) = 0$.

   (b) What is the distance traveled by the object in one minute?

2. A two–meter rod is made up of a material with linear density $\rho(x) = 1 + 3x$, for $0 \leqslant x \leqslant 2$, in grams per meter, where x is measured in meters. Compute the mass of the rod.

3. *(Moment of a Rod).* The **moment** of a rood along the x–axis over the interval $[a, b]$ ii given by the formula $M_x = \displaystyle\int_a^b x\rho(x)\ dx$, where $\rho(x)$ is the linear density of the rod, in grams per meter, and x is measured in meters. Compute the moment of the rod described in Problem 2.

4. *(Center of Mass of a Rod).* The x–coordinate of the center of mass of a rod along the x–axis is given by the formula $\overline{x} = \dfrac{M_x}{M}$, where M_x is the moment of the rod and M is the mass of the rod.

   Compute the x–coordinate of the center of mass of the rod given in Problem 2.

5. *(Average of a Function).* Given a piecewise continuous function f defined over and interval, I, which contains a and b with $a < b$, the **average value** of f over $[a, b]$ is defined by the formula

$$\overline{f} = \frac{1}{b-a}\int_a^b f(x)\ dx.$$

   Compute the average linear density of the rod described in Problem 2.