Math 1300-018 Quiz 10 Name:________________________

1. For each of f_i below, find an antiderivative F_i satisfying the given condition.

   (a) $f_1(x) = \sin(2x+1),\ F_1(-1/2) = 0$

$$F_1(x) = -\frac{1}{2}\cos(2x+1) + C,\ F_1(-1/2) = -\frac{1}{2} + C = 0 \Rightarrow C = \frac{1}{2}$$

$$F_1(x) = -\frac{1}{2}\cos(2x+1) + \frac{1}{2}$$

   (b) $f_2(x) = \dfrac{4}{1+x^2},\ F_2(1) = 0$

$$F_2(x) = 4\arctan x + C,\ F_2(1) = 4\frac{\pi}{4} + C = \pi + C = 0 \Rightarrow C = -\pi$$

$$F_2(x) = 4\arctan x - \pi$$

   (c) $f_3(x) = \dfrac{2}{x^3},\ F_3(1) = 0,\ F_3(-1) = 2$ [The domain $(-\infty, 0) \cup (0, \infty)$ consists of two intervals, so we can define an antiderivative piecewise, using a different constant for each interval.]

   The basic antiderivative here is $-x^{-2} + C$. Using a different constant for each interval, we get

$$F_3(x) = \begin{cases} -\frac{1}{x^2} + C_2 & x \in (-\infty, 0) \\ -\frac{1}{x^2} + C_1 & x \in (0\infty) \end{cases} .$$

   We have $F_3(1) = 0 = -1 + C_1$ so that $C_1 = 1$ and $F(-1) = 2 = -1 + C_2$ so that $C_2 = 3$. Hence

$$F_3(x) = \begin{cases} -\frac{1}{x^2} + 3 & x \in (-\infty, 0) \\ -\frac{1}{x^2} + 1 & x \in (0, \infty) \end{cases} .$$

2. Over the course of an hour of driving, you check your speed every ten minutes, obtaining the data in the table below.

t (minutes)	0	10	20	30	40	50	60
speed (mi/hr)	35	30	40	45	35	25	5

Estimate the distance traveled over the course of the hour by averaging to estimates, one obtained by assuming your speed over each ten minute interval was constantly the value given at the beginning interval (left endpoint Riemann sum) the other obtained by assuming your speed was constantly the value given at the end of the interval (right endpoint Riemann sum).

The left endpoint Riemann sum is

$$L = \frac{1}{6}(35 + 30 + 40 + 45 + 35 + 25) = \frac{210}{6} = 35 \text{ miles}$$

and the right endpoint Riemann sum is

$$R = \frac{1}{6}(30 + 40 + 45 + 35 + 25 + 5) = \frac{180}{6} = 30 \text{ miles.}$$

Averaging these we get 32.5 miles.