Name: ____________________________

Directions: MAKE SURE TO COPY YOUR ANSWERS TO A SEPARATE SHEET FOR SENDING ME AN ELECTRONIC COPY LATER.

1. (15) State why the following code doesn't work. (Do NOT state how to fix it.)

```
integrate(function(x) x^2,1,4) +
integrate(function(x) x,4,5)
```

2. Consider the example in Sec. 12.2.1. Find the following:

(a) (15) $F_{\overline{X}}(70.1)$

(b) (15) EX_2

(c) (15) In this part only, suppose we sample without replacement. Find $Cov(X_1, X_2)$.

3. Again consider Sec. 12.2.1 (sampling with replacement), in our "notebook" context, with $n = 100$ We have columns for $X_1, X_2, ..., X_{100}, \overline{X}, s^2, \overline{X} - 1.5s/\sqrt{100}, \overline{X} + 1.5s/\sqrt{100}$. (Here s is as in (12.23). Find the following:

(a) (10) The long-run average value in the $\overline{X}$ column.

(b) (10) The long-run average value in the s^2 column.

(c) (10) The long-run proportion of notebook lines for which the population mean is between the values in the last two columns.

4. (10) Consider the code on pp.227-228, but with **rexp(1,0,1** in line 4 replaced by **runif(1,0,1)**. Give the approximate value of the output in line 12.

Solutions:

1. We are trying to add two objects of class **'integrate()**, rather than add two numbers.

2.a

$$\frac{1}{9} + \frac{2}{9} + \frac{1}{9} = \frac{4}{9}$$

2.b $EX_i = \mu = (69 + 70 + 72)/3$

2.c

$$Cov(X_1, X_2) = E(X_1 X_2) - EX_1 \ EX_2 = E(X_1 X_2) - \mu^2$$

$$E(X_1 X_2) = (69 \cdot 70 + 69 \cdot 72 + 70 \cdot 72)/3$$

3.a μ

3.b

$$E(s^2) = \frac{99}{100} \sigma^2$$

$$\sigma^2 = E(X^2) - (EX)^2 = (69^2 + 70^2 + 72^2)/3 - \mu^2$$

3.c This is a confidence interval, for which we are being asked to find the confidence level. This is

```
1 - 2 * pnorm(-1.5)
```

(The original version had $\sqrt{2}$ rather than $\sqrt{100}$. The problem was not graded.

4. Use (9.42). Here $EX = 0.5$ and $f_X(t) = 1$. So, $f_Y(t) = 2t$. Then

$$EY = \int_0^1 t \cdot 2t \ dt = \frac{2}{3}$$

So the mean length of the interval we arrive within is 2/3, and the mean time to the next/last bus is 1/3.