Name: ____________________________

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

1. In the committee example, Section 11.1.3, consider the covariance matrix C of the random vector $(G_1, G_2, G_3, G_4)'$.

(a) (20) Find the value of C_{12}, the element in row 1, column 2 of C. (Row and column numbers begin at 1.)

(b) (25) Suppose in our R code, we have already computed C, and we have stored the first two rows and columns in an R matrix we have named **CG**. Let $H_1 = G_1 + G_2$ and $H_2 = G_1 - 2G_2$. Give R code to find the covariance matrix of $H = (H_1, H_2)'$.

2. (25) Consider the setting in Section 9.3.2, with three electronic parts. Let M denote the number of parts that last more than time 2.5. Find $Var(M)$.

3. (15) Suppose photographs in a certain setting are corrupted by small, straight streaks, the lengths of which have density $4t^3$ on (0,1), 0 elsewhere. However, those checking the photographs are more likely to spot the longer ones, in proportion to the actual length; streaks twice as long, for instance, are twice as likely to be spotted. Give the density of the streaks that are noticed, expressed as an R function of **t**, i.e. **function(t)** _______________.

4. (15) Consider the Catchup Game, Section 11.2.1. Give a single, loop-free line of R code to print the approximate value of the probability that after **nturns** turns, the winning and losing sides are apart by less than 1.0.

Solutions:

1.a This is $Cov(G_1, G_2)$. From the computations already done in that section, we see that this is $5/12 - 4/9$.

1.b

```
a <- rbind(c(1,1),c(1,-2)); a %*% CG %*% t(a)
```

2. Binomial.

```
p <- 1 - pexp(2.5,1/2.5); 3*p*(1-p)
```

3. Use (9.42).

```
4 * t*t^3 / integrate(t*4*t^3,0,1)
```

4.

```
print(mean(abs(xyvals[,1] - xyvals[,2]) < 1.0))
```