Name: _____

Directions: **Work only on this sheet** (on both sides, if needed). MAKE SURE TO COPY YOUR ANSWERS TO A SEPARATE SHEET FOR SENDING ME AN ELECTRONIC COPY LATER.

Important note: Remember that in problems calling for R code, you are allowed to use any built-in R function, e.g. **choose()**, **sum()**, etc.

1. Suppose X has the density $2/t^3$ on $(1,\infty)$, 0 elsewhere. Note: This problem is numerical (as are most of our Quiz problems), so it requires R expressions as answers. That R expression must evaluate to a number. You may use **integrate()** if you know how, but it's easier just to do the integration yourself.

(a) (15) Find $F_X(2)$.

(b) (20) Find EX.

2. Consider the Markov model of bus ridership, pp.87ff.

(a) (15) Find p_{11}.

(b) (10) Suppose we wish to find the long-run average number of passengers that alight from the bus, per stop. This will be

$$\sum_{i=0}^{20} \pi_i w_i$$

Give the value of w_1.

3. (20) Suppose in modeling disk performance, we describe the position X of the read/write head as a number between 0 and 1, representing the innermost and outermost tracks, respectively. Say we assume X has a uniform distribution on (0,1). Consider two consecutive positions (i.e. due to two consecutive seeks), X_1 and X_2, which we'll assume are independent. Find $Var(X_1 + X_2)$.

4. (20) Consider the network intrusion model, pp.104-105. Assume there is never an intrusion, i.e. all logins are from Jill herself. Say we've set our network intrusion monitor to notify us every time Jill logs in and accesses 535 or more disk sectors. In what proportion of all such notifications will Jill have accessed at least 545 sectors?

Solutions:

1.a

$$F_X(2) = \int_1^2 \frac{2}{t^3}\, dt = \frac{3}{4}$$

1.b

$$EX = \int_1^\infty t \cdot \frac{2}{t^3}\, dt = 2$$

2.a

$$(1 - 0.2) \cdot 0.5 + 0.2 \cdot 0.4$$

2.b 0.2

3. 1/12 + 1/2

4. This is $P(X \geq 545 | X \geq 535)$. By an analysis similar to that in Section 5.5.2.3, this probability is

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(1 - pnorm(545,500,15) / (1 - pnorm(535,500,15))
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