EGN 1932 Homework 3 (The Waiting-Time Paradox) 20 Points

Consider a renewal process. Let X be the interrenewal times; and let I and R be the length of an interval interrupted at random and its remainder, respectively. The following BASIC simulation calculates the average values of X, I, and R (based on 10,000 replications of I and R, where T is a random interruption point). (A concrete example: X could be the time between successive taxis, T the time of arrival of a customer who wants a taxi, I the time between the taxi that arrived just before T and the taxi that arrives just after T, and R the time that the customer waited for the next taxi.)

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RANDOMIZE
100 FOR j=1 TO 10000
110 S=0
120 T = -1000*LOG(1 - RND)
130                [generate X]
140 c=c+1
150 SX=SX+X
160 S=S+X
170 IF S<T THEN 130
180 R=S-T: I=X
190 SR=SR+R: SI=SI+I
200 NEXT j
210 PRINT SX/c, SI/10000, SR/10000
```

Consider the three cases:

(1) X=2 (constant)
(2) P(X=1)=0.9 and P(X=11)=0.1
(3) P(X=2)=0.9 and P(X=12)=0.1

Run the simulation for each case, and fill in the following table.

	E(X)		E(I)		E(R)	
Case	Theory	Simulation	Theory	Simulation	Theory	Simulation
1	2		2		1	
2	2					
3	3					

Describe your observations. Show (or explain) how you can calculate the theory values given in the table. Try to explain why the values for E(I) and E(R) are so weird (if they are) in cases 2 and 3.