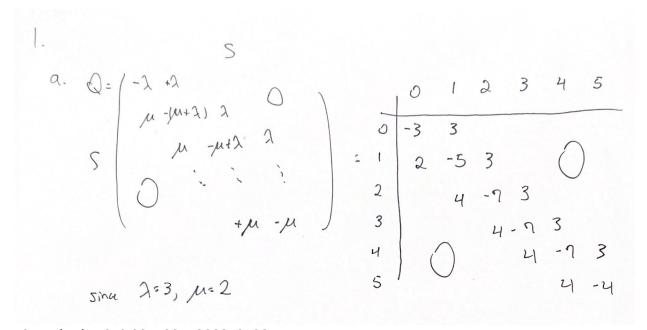
Brandon Alston CAAM 586 HW 4

Problem 1



DTMC Method IDC: 0.0054231130085212855

Uniformization Method IDC: 0.0023830598614701308

Problem 2 IDC: 0.03766

Problem 3

E[X_40]: 20.194048369165383 Var[X_40]: 13.434169436576234

Problem 4

a. B/c
$$\frac{\sigma^2}{n}$$
 < d is "true" variance we want

to generate $n > \frac{\sigma^2}{2} = \frac{1}{.01} = 100$ samples generated

e. They were not as more often than not only 100 samples were need until I was met. Further 5, the an close to 1,0 as expected.

Number generated: 100

Sample mean: -0.009157738667097496 Sample var: 0.9824323963802654

Problem 5

5.

a. First note
$$P(m>n) = P(U_1 \neq U_2 \neq \dots \neq U_{n-1} \neq U_n)$$

Since $P(U_n \geq U_{n-1}) \leq \frac{1}{2} \forall n$ and $P(U_1 \geq U_2 \geq \dots \leq U_{n-1} \geq U_n) = \frac{1}{(n-1)!}$

then clearly $P(m>n) = \frac{1}{n!}$

b. $E[m] = \sum_{n \in \mathbb{N}} p(m>n) = \sum_{n \in \mathbb{N}} \frac{1}{n!} = e$

95% CI: [2.7179826765192265 , 2.818017323480773]

Problem 6

I couldn't get my code to work properly

7. Pr pros. fail, li: nonfail cycle time length, lz= time to failure at failing cycle

a. First note, P(1st failure on kth cycle) = (1-P)k-1P

"Time" to reach first fail on kth cycle =

"time" previous k-1 cycles fail the time of kth cycle fail

= R1(k-1)+l2

thus $l = \sum_{k=1}^{\infty} (1-p)^{k-1} p[(k-1)l_1 + l_2]$ = $l_1 + pl_1 \sum_{k=1}^{\infty} (1-p)^{k-1} p$

and $E[l] = l_2 + \frac{1-p}{p} l_1$ $var(l) = var(l_2) + \left(\frac{1-p}{p}\right)^2 var(l_1) \text{ since iid cycles}$ $so \ \partial = E[l] + \frac{var(l)}{\sqrt{p}} t_{d/2}$

b. E[l₁]: 20.2 Var[l₁]: 18.6 p= \frac{87}{1000} E[l₁]: 54 Var[l₂]: 3.1 n= 1000

ESEJ: 5.4 + 20.2 (1-.089) Var(l): 3.1 + (1-.089) 2 (18.6) = 2051.51

. 217.34

0= 217.34 + 64.87 ta/2