1.3 Problem 3 (5 points)

Consider a medical insurance company. 20% of the policies are for one per-

son. 80% are family policies. A family can have 2 members, 3 members, 4

members, or 5 members with equal probability. Each person has a 2% prob-

ability of \_ling a claim within a given year. Each claim can range from $1000

to $100,000 with equal probability. Assume the company makes no pro\_t

and has no operating costs. Also assume that a family policy costs twice as

much as an individual policy. How much should the insurance policy cost?

Do it numerically and analytically.

For individual policy,

Expected value for n people = (n \* 0.02 \* (100000+1000)/2)/n = 1010

For family with two,

Expected value = ( n\*2\* 0.02\*0.98\*(100000+1000)/2+n\*0.02\*0.02\*2\*(100000+1000))/n

= (2\*0.02\*0.98+0.02\*0.02\*2)(100000+1000)/2 = 2020

For family with three,

Expected value = 0.023\*(50500\*3)+3\*0.02\*0.982\*50500+3\*0.022\*0.98\*101000

= 3030

For family with four

Expected value=4040

For family with five

Expected value = 5050

Thus, Total expected value = 1010\*0.2+2(2020\*0.2+3030\*0.2+4040\*0.2+5050\*0.2)

= 202 +2(404+606+808+1010)

= 5858

So, the average cost of policy(include individual and family with 2 to 5 members) is 5858.

Since 0.2X(individual policy cost)+2\*0.8X=5858, X = 3254. For individual policy, the average cost is 3254 per person. For family policy cost, the average cost is 6508.

For Python result,

Using my sourcecode saved in the winrar, I got the result:

>>> simulation(1000000)

5861.005223864773

Which is near my calculation, 5858.