1. (9 points) Write a program to simulate the **expected waiting time** of Example 3.14 (page 168 of the textbook).

   Solution: results should be close to **6.25 minutes, see the pdf derived** in Pg 168 of the textbook.

2. (8 points) pg 190 problem 18

   (a)

$$E[X] = \int_1^3 \frac{x^2}{4} dx = \frac{x^3}{12}\Big|_1^3 = \frac{26}{12} = \frac{13}{6}$$

$$P(A) = \int_2^3 \frac{x}{4} dx = \frac{x^2}{8}\Big|_2^3 = \frac{5}{8}$$

$$f_{X|A} = \begin{cases} \frac{f_X(x)}{P(A)} & \text{if } x \in A\} \\ 0 & \text{otherwise} \end{cases} = \begin{cases} \frac{2x}{5} & \text{if } 2 \le x \le 3\} \\ 0 & \text{otherwise} \end{cases}$$

$$E[X|A] = \int_2^3 x\frac{2x}{5} = \frac{2x^3}{15}\Big|_2^3 = \frac{38}{15}$$

   (b)

$$E[Y] = [E[X^2] = \int_1^3 \frac{x^3}{4} dx = \frac{1}{16}x^4\Big|_1^3 = \frac{80}{16} = 5$$

$$E[y^2] = E[x^4] = \int_1^3 \frac{x^5}{4} dx = \frac{1}{24}x^6\Big|_1^3 = \frac{1}{24}(729-1) = \frac{728}{24} = \frac{91}{3}$$

$$var(Y) = E[Y^2] - (E[Y])^2 = \frac{91}{3} - 25 = \frac{16}{3}$$

3. (8 points) pg 190 problem 19 a, b

$$1 = \int_1^2 cx^{-2} dx = c\left(-\frac{1}{2} - -\frac{1}{1}\right) = c\frac{1}{2}$$

   (a)

$$c = 2$$

   (b)

$$P(A) = \int_{1.5}^2 2x^{-2} dx = \frac{1}{3}$$

$$F_{X|A}(x) = \begin{cases} 6x^{-2} & \text{if } 1.5 \le x \le 2\} \\ 0 & \text{otherwise} \end{cases}$$