STA 361

Midterm Exam (50 pts)

Name Iven Wany

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Write your answers to the following questions in the space provided. You will not turn in any code, but you may wish to save your code for a future day when we go over the answers.

- 1. (8 pts)
 - a) Create a vector called V1 that contains integers between 300 and 625 in increments of 13. State the sum of the elements in V1.

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- b) Create a vector called V2 that contains the first 50 perfect squares (i.e. $1^2 = 1$, $2^2 = 4$, etc.). State the sum of elements in V2. 42925
- c) The intersect(.) function accepts two vectors as arguments and produces a new vector containing the elements that occur in both vectors. Create a new vector V3, which is the intersection of V1 and V2. State any elements in V3.

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d) Create a vector called V4 that contains integers between 250 and 2500 (inclusive). Obtain the value of the following expression, where \ln is the natural \log (base e):

$$\sum_{i=250}^{2500} \ln{(i)}$$

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2. Use a while loop to determine the first integer value of x such that the function:

$$g(x) = 3x^2 - 5x + 12$$

exceeds one million (1,000,000). For partial credit, you may write your code block in the

space below. (6 pts) 9 & function (x) { veturn (3 * 3/2) -5 * x +12

3. Suppose that Y is a discrete random variable following a geometric distribution (see the help file for dgeom(.)) with parameter p = 0.2. When necessary, round your answers to 4 decimal places. (14 pts)



b)
$$P(Y > 10)$$

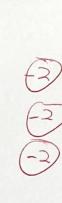
c)
$$P(Y = 4)$$

d)
$$P(2 \le Y < 8)$$

e) The median of the distribution of Y.

f)
$$P((Y \le 2) \text{ or } (Y > 9))$$

g) The value c such that P(Y > c) = 0.05



4. Define the matrix objects below and write your answers to the following questions in the space provided. The usual symbols may appear for matrix inverse and matrix transpose.

$$A = \begin{bmatrix} 15 & -9 \\ 10 & 7 \\ 6 & 3 \end{bmatrix} \quad B = \begin{bmatrix} 8 & 13 & 3 \\ 26 & 9 & 24 \\ 3 & 12 & 17 \end{bmatrix} \quad C = \begin{bmatrix} 5 \\ 4 \\ 3 \end{bmatrix} \quad D = \begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}$$

a) Obtain the sum of elements in the matrix AD.



b) Report the sum of the elements contained in $B^{-1}A$.

0.8202582

c) State the trace of matrix CC'. Recall that the tr(.) function in the "psych" package will compute the trace.

d) State the (2,2) element of A'B.

- 5. The data set food.txt (UBLearns) contains historical data on 36 food distributors. Each row describes a different distributor. (14 pts) a) Import the data set into R and state the number of variables that are in the resulting data frame. b) Obtain a data frame that only contains distributors that have the promotion variable equal to 1. State the number of rows in this data frame. 20 c) Obtain a data frame containing the food distributor that has market_share smaller than 2.5 and nielsen_rating larger than 525. State the id of this distributor. d) Obtain a data frame containing the food distributor that has month "Apr" and discount 0. State the market_share of this distributor. e) Obtain a data frame containing food distributors having month set to "Jan," "Feb," or "Mar." State the average price for distributors in this data frame. 2.245 889 Obtain a data frame containing food distributors that either have year equal to
 - g) Add a new variable to the original food data frame. The new variable is calculated as:

2001 or have nielsen_rating above 400. State the number of rows in this data

$$discount + \left(\frac{2.7 \times price}{market_share}\right)$$

State the minimum observed value of this new variable.

frame.

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