

1. Write a well commented program in R that does the following;

- ✓ (a) Accepts any matrix and returns the m^{th} power of the matrix. (4marks)
 (b) Returns the trace of the resulting matrix in (a) above. (2marks)
 (c) Calls the program created in (a) and (b) above using the matrix; (2marks)

$$A = \begin{pmatrix} 1 & 1 & 3 \\ 5 & 2 & 4 \\ -3 & 4 & 0 \end{pmatrix}$$

2. Suppose a firm manufactures radios and sells them for \$50 each. If the costs incurred in the production and sale of the radios are \$200000 plus \$10 for each radio produced and sold; (provide the expected output for each of the following)

- (a) Write the profit function for the production and sale of radios. ✓
 (b) Write a program in R that plots the revenue, cost and profit functions on one graph.
 (c) Write a program in R that computes the marginal cost, marginal revenue and the marginal profit.
 (d) Write a program in R that computes the break-even point. [2, 2, 2, 2 marks]

3. The temperature T recorded during a day followed the curve

$$T = 0.006t^5 - 0.724t^3 + 25$$

Where t is the number of hours from noon.

- (a) State the limits for t. (1mark)
 (b) Write a program in R that uses the for loop and Monte carlo simulation to determine the average temperature during a day. (5marks)
 (c) Determine the expected output in (b) above. (2marks)

✓ 4. Write an R code to determine the following integral and clearly showing your working, give the expected output. (6marks)

$$\int_2^8 \left(\frac{4}{1+2t} \right) dt$$

if value