ASSIGNMENT 1- JUNE 2025

1. A hospital blood bank conducts an annual blood drive to replenish its inventory of blood. The hospital estimates the blood will be donated at the rate of ***r(t)*** pints per day, where ***d(t)= 300e$^{-0.1t}$*** and t equals the length of the blood drive in days. If the goal for blood drive is 2,000 pints, when will the hospital reach its goal?

2. A manufacturer of jet engines estimates that the rate at which maintenance costs are incurred on its engines is a function of the number of operation of the engine. For one engine used on commercial aircraft, the function is ***r(x)= 60 + 0.04x^2*** where ***x*** equals the number of hours of operation and ***r(t)*** equals the rate at which repair costs are incurred in dollars per hour of operation
   (a) Determine the rate at which costs are being incurred after 100 hours of operation
   (b) What are total costs expected t equal during the first 100 hours of operation

3. QT students were discussing the relationship between average cost and total cost. One student said that since average cost is obtained by dividing the cost function by the number of units ***q***, it follows that the derivative of the average cost is the same as marginal cost, since the derivative of ***q*** is 1. Comment on this analysis.

4. Revenue and average cost function for a given firm are given as
   AR = 4 - ¼ q
   AC = 4/q + 2 – 0.3q + 0.05q^2
   Required: Find the level of output that would max the profit and compute the maximum profit.

5. A manufacturer has determined a cost function, which expresses the annual cost of purchasing, owning and maintaining its raw material inventory as a function of the size of each order. The cost function is: $C = \frac{51{,}500}{q} + 80q + 750{,}000$
   Where q equals the size of each order (in tons) and C equals the annual inventory cost. Determine the order size ***q***, which minimizes annual inventory cost.

6. A firm's demand function is given by P= 100-2x and its cost function C(x) =20x + 3000. Determine the optimum level of output for profit maximization.