

3.4 Optimization Problems in Economics and Science

To maximize revenue, use the revenue function: revenue = price per unit x number of units

Example 1: A commuter train carried 2000 passengers daily from a suburb into a large city. The cost to ride the train is \$7 per person. Market research shows that 40 fewer people would ride the train for each \$0.10 increase in the fare, and 40 more people would ride the train for each \$0.10 decrease. If the capacity of the train is 2600 passengers, and carrying fewer than 1600 passengers means costs exceed revenue, what fare should the railway charge to get the largest possible revenue?

Example 2: A cylindrical chemical storage tank with a capacity of 1000 m^3 is going to be constructed in a warehouse that is 12 m by 15 m, with a height of 11 m. The specifications call for the base to be made of sheet steel that costs $\$100/\text{m}^2$, the top to be made of sheet steel that costs $\$50/\text{m}^2$, and the walls to be made of sheet steel that costs $\$80/\text{m}^2$.

- a) Determine whether it is possible for a tank of this capacity to fit in the warehouse. If it is possible, state the restrictions on the radius.
- b) If fitting the tank in the warehouse is possible, determine the proportions that meet the conditions and that minimize the cost of the steel for construction.