

University of South Carolina
Math 170: Finite Mathematics
Section 006
Spring 2012

Test 1

Please write *only* your name on the test sheet.

Place all work and answers on the blank sheets provided.

1. A factory can produce 100 bicycles in a day at a total cost of \$10,500, and it can produce 120 bicycles in a day at a total cost of \$11,000.
 - (a) Assuming a linear relationship, write a function $c(x)$ that gives the cost to manufacture x bicycles.
 - (b) According to your function from part a, how many bicycles can be produced for \$20,000?
2. Let p be the price, in dollars, for a monorail ticket. Demand for tickets is given by the function $D(p) = 64p^{-0.76}$ (in thousands of tickets). The monorail company can provide service according to the function $S(p) = 2.5p + 15.5$ (in thousands of tickets).
 - (a) What is the equilibrium price for the tickets? How many tickets will be sold at this price?
 - (b) What is the estimated shortage/surplus if the price is set at \$5 per ticket?
3. A certain farm may grow soybeans, corn, and wheat. Set up but **do not solve** a linear programming problem to determine how many acres of each crop to plant in order to maximize its profit.
 - The farm encompasses 900 acres of land.
 - Fertilizer costs (per acre) are \$5 for soybeans, \$2 for corn, and \$1 for wheat.
 - Weekly labor costs (per acre) are 5 hours for soybeans, 2 hours for corn, and 2 hours for wheat.
 - Profits (per acre) are \$3,000 for soybeans, \$2,000 for corn, and \$1,000 for wheat.
 - You cannot spend more than \$3,000 for fertilizer.
 - You must spend at least 2,000 hours of labor per week.
4. An electronics company acquires a warehouse full of cogs, sprockets, and widgets.
 - A Device requires 2 cogs, 1 sprocket, and 2 widgets.
 - A Gadget requires 1 cog, 1 sprocket, and 2 widgets.
 - A Thing requires 1 cog, 2 sprockets, and 1 widget.

If the warehouse contains 350 cogs, 350 sprockets, and 400 widgets, how many Devices, Gadgets, and Things should the company produce to use up the entire inventory?
5. Consider a lopsided version of the Odds and Evens game: Each player may show either one or two fingers. If the sum is odd, you win \$1. If the sum is even, you lose \$2. What is your safest strategy according to the minimax criterion?
6. A small town has a lumber mill and a paper factory. In a particular month, the lumber mill used \$30,000 of its own resources and \$100 of the paper factory's resources to produce a total of \$100,000 worth of goods. In the same month, the paper factory used \$20,000 of its own resources and \$7,000 of the lumber mill's resources to produce a total of \$200,000 worth of goods. What monthly production levels are necessary to meet an external demand of \$200,000 in lumber products and \$300,000 in paper products?