

## Math 4428 Homework 5

due February 26, 2007

1. A manufacturer of bicycles uses the same basic frame for both its 10-speed and 15-speed models. The plant can produce 100 frames a day. Tires, brakes and gearing mechanisms are purchased from a supplier. The final two stages of production are to apply the appropriate finish and then assemble and package for shipment. There are 40 hours of time available each day in the finishing shop and 50 hours in the assembly/packing shop. The profit is \$12 for a 10-speed and \$15 for a 15-speed.

The following table gives the number of hours required per bicycle in each of the final stages

	10-speed	15-speed
Finishing	$\frac{1}{3}$	$\frac{1}{2}$
Assembly/Packing	$\frac{1}{4}$	$\frac{2}{3}$

Your task is to help determine how many of each model should be produced in order to maximize profit.

- (i) Produce a picture of the feasible region.
  - (ii) Use Matlab command `linprog` to solve this problem. Indicate where the solution lies in the picture. Does it make sense?
2. The bicycle manufacturer in the previous problem is considering an expansion in production capacity. It will require hiring workers to work overtime. The available overtime and incremental costs are

	Hours available	Incremental cost per hour
Finishing	16	\$6
Assembly/Packing	16	\$4.5

The construction of up to 100 additional frames per day can be outsourced at a cost of \$4 more per frame than if they were made in house.

How many additional frames should be ordered each day, and how should the overtime production be scheduled? Hint: Introduce 3 more variables – number of overtime hours in the finishing, number of overtime hours in assembly/packaging, number of outsourced frames.

3. Problem 3.9.