Exam III Review Sheet
MATH 105, Spring 2003

This exam will cover sections 5.1 and 5.4 in your text, along with the supplemental material available on the course website. You should know general terms and definitions from each of these sections, review the homework and quizzes given for these sections, and pay particular attention to the subjects and practice problems mentioned below.

1. Working with basic linear equations and polynomials.
2. Finding the slope and \( y \)-intercepts of a line by putting the equation in slope-intercept form.
3. Graphing lines in the \( xy \)-plane.
4. Determining the type of solution to a system of two equations in two unknowns.
5. Solving systems of two or three equations in two or three unknowns using substitution or addition.
6. Graphing regions defined by a system of linear inequalities.
7. Finding corner points of regions defined by a system of linear inequalities.
8. Setting up and solving systems of equations from story problems.
9. Setting up linear programming problems.
10. Minimizing or maximizing an objective function on a bounded feasible set.
11. Minimizing or maximizing an objective function when possible on an unbounded feasible set.

Below is a list of sample problems. This list is not all-inclusive, but does represent the basic types of problems you may see on the exam.

1. Perform the following operations on polynomials, simplifying completely.
   (a) \((4x^3 + 3x^2 - 1) - (3x^2 - x + 5)\)
   (b) \((4x - 3)(2x + 5)\)
   (c) \((x + 2)^2 - (2x - 1)(x + 3)\)

2. Find the slope and \( y \)-intercept of each of the following lines.
   (a) \(y = \frac{1}{3}x - 3\)
   (b) \(4y - 5x = 15\)
   (c) \(2y + 4x = 7 - 5x\)
   (d) \(3(2x + 4) = 5y - 1\)

3. Graph the lines below by finding the \( x \)- and \( y \)-intercepts.
   (a) \(10x + 15y = 60\)
   (b) \(7x - 5y = -35\)
   (c) \(-6x + 3y = 12\)

4. Determine the solution type for each of the following systems of linear equations. For those with a unique solution, find that solution using both the addition and the substitution methods.
   (a) \(2x + 6y = 44\)
      \(-3x + 5y = 32\)
   (c) \(4x + 6y = 12\)
      \(2x + 3y = 6\)
   (b) \(8x - 32y = 15\)
      \(4x - 16y = 21\)
   (d) \(5x - \frac{1}{2}y = -16\)
      \(\frac{1}{2}x + 7y = 13\)
5. Set-up and solve the following story problems involving systems of equations.

(a) A pet food company makes two types of dog food—Hearty Blend and Nature’s Best. The Hearty Blend mixture requires 3 lbs. of rice and 6 lbs. of meat per 10 lb. bag. The Nature’s Best mixture takes 5 lbs. of rice and 4 lbs. of meat per 10 lb. bag. The factory has 135 lbs. of rice and 180 lbs. of meat ready. How many 10 lb. bags of each blend should be made to use up the factory’s supply?

(b) Herbert and Gertrude’s Trail Mix Company makes two types of trail mix. The first mix uses 2 oz. of nuts and 1 oz. of chocolates per package. The second type requires 1 oz. of nuts and 3 oz. of chocolates per package. If they have 45 oz. of nuts and 30 oz. of chocolates, how many packages of each type should they make to exactly use their supply of nuts and chocolates?

6. Graph the region bounded by the following inequalities.

(a) \[3x - 5y \leq 15\]
\[10x - 5y \geq -15\]
\[x \geq 0, \ y \geq 0\]

(b) \[7x + 2y \geq 14\]
\[-3x + 6y \geq 9\]
\[x \geq 0, \ y \geq 0\]

(c) \[2x + 5y \leq 10\]
\[5x + 2y \leq 20\]
\[x \geq 0, \ y \geq 0\]

7. Solve the following linear programming problems.

(a) A toy maker produces two types of hand-made trucks: a small truck and a large truck. The small truck takes 1 oz. of steel and 2 oz. of plastic. The large truck takes 3 oz. of steel and 1 oz. of plastic. There is a supply of 13 oz. of steel and 11 oz. of plastic on hand. The toy maker is currently out of both types of trucks and must make at least one of each to restock the shelves. If he makes a profit of $100 on the large trucks and $60 on the small trucks, how many of each type of truck should he make to maximize his profit, and what will that profit be?

(b) A concrete mixing firm offers two versions of mix. Each ton of standard mix requires 0.30 tons of sand and 0.50 tons of limestone and sells for $500. Each ton of super mix requires 0.35 tons of sand and 0.55 tons of limestone and sells for $720. Each day there are 160 tons of sand and 70 tons of limestone available. The firm has an ongoing contract to provide 2 tons of standard mix a day to a local construction company. How many tons of each type of mix should the firm make to maximize the sales amount?

8. Which of the following statements is a correct interpretation of the solution to the unbounded minimization/maximization problem shown below?

A. The objective function obtains both a minimum and a maximum.
B. The objective function obtains a minimum but has no maximum.
C. The objective function obtains a maximum but has no minimum.
D. The objective function has neither a minimum nor a maximum.
E. None of the above.