Exam III - Answers to Review Sheet  
MATH 105, Spring 2003

1. Perform the following operations on polynomials, simplifying completely.
   (a) $4x^3 + (3 - 3)x^2 - (-x) + (-1 - 5) = 4x^3 + x - 6$
   (b) $(4x)(2x) + (4x)(5) + (-3)(2x) + (-3)(5) = 8x^2 + 20x - 6x - 15 = 8x^2 + 14x - 15$
   (c) $(x^2 + 4x + 4) - (2x^2 + 6x - x - 3) = -x^2 - x + 7$

2. Find the slope and y-intercept of each of the following lines.
   (a) $y = \frac{1}{3}x - 3$, Slope = $\frac{1}{3}$, intercept = $-3$.
   (b) $y = \frac{5}{4}x + \frac{15}{4}$, Slope = $\frac{5}{4}$, intercept = $\frac{15}{4}$.
   (c) $y = -\frac{9}{2}x + \frac{5}{2}$, Slope = $-\frac{9}{2}$, intercept = $\frac{5}{2}$.
   (d) $y = \frac{6}{5}x + \frac{13}{5}$, Slope = $\frac{6}{5}$, intercept = $\frac{13}{5}$.

3. Graph the lines below by finding the x- and y-intercepts.

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) Unique Solution: $(1, 7)$.
   (b) No Solution.
   (c) Infinitely Many Solutions.
   (d) Unique Solution: $(-3, 2)$.

5. Set-up and solve the following story problems involving systems of equations.
   (a) Unknowns: $x$ = bags of Hearty Blend, $y$ = bags of Nature’s Best.  
      Resources: Rice and Meat.  
      Equations: $3x + 5y = 135$  
                  $6x + 4y = 180$  
      Solution: 20 bags Hearty Blend, 15 bags Nature’s Best.

   (b) Unknowns: $x$ = packages mix 1, $y$ = packages mix 2.  
      Resources: Nuts and Chocolates.  
      Equations: $2x + y = 45$  
                  $x + 3y = 30$  
      Solution: 21 bags of mix 1, 3 of mix 2.
6. Graph the region bounded by the following inequalities.

(a) 

(b) 

(c) 

7. Solve the following linear programming problems.

(a) Unknowns: \( x = \) number of small trucks, \( y = \) number of large trucks

Resources: Plastic and Steel.

Objective Function: Maximize \( 60x + 100y \).

Constraints: \( x + 3y \leq 13, \ 2x + y \leq 11, \ x \geq 0, \ y \geq 0 \).

Corners of Feasible Region: \( (0,0), (0,4\frac{1}{3}), (4,3), (5\frac{1}{2},0) \).

Solution: 4 small and 3 large trucks produces maximum profit of $540.

(b) Unknowns: \( x = \) tons of standard mix, \( y = \) tons of super mix

Resources: Sand and Limestone

Objective Function: Maximize \( 500x + 720y \) Constraints: \( 0.3x + 0.35y \leq 160, \ 0.5x + 0.55y \leq 70, \ x \geq 2, \ y \geq 0 \).

Corners of Feasible Region: \( (2,125.5), (0,140), (2,0) \)

Solution: 2 tons standard and 129.1 tons super for a maximum profit of $93,952.

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

<table>
<thead>
<tr>
<th>Point</th>
<th>Objective Function Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>P</td>
<td>13</td>
</tr>
<tr>
<td>Q</td>
<td>-2</td>
</tr>
<tr>
<td>R</td>
<td>-3</td>
</tr>
<tr>
<td>S</td>
<td>5</td>
</tr>
</tbody>
</table>

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.

Statement C is correct