Finite Math - J-term 2019

Lecture Notes - 1/21/2019

Homework

- Section 4.1 - 17, 19, 21, 23, 25, 27, 31
- Section 5.2 - 1, 3, 5, 7, 9, 11, 13, 16, 17, 18, 19, 20, 21, 24, 33, 38, 39, 41

Solving by Substitution. When solving a system by substitution, we solve for one of the variables in one of the equations, then plug that variable into the other equation.

Example 1. *Solve the following system using substitution*

$$\begin{array}{rcrcl} 2x & - & y & = & 3 \\ x & + & 2y & = & 14 \end{array}$$

Solution.

Example 2. *Solve the following system using substitution*

$$\begin{array}{rcrcl} 3x & + & 2y & = & -2 \\ 2x & - & y & = & -6 \end{array}$$

Solving Using Elimination. We now turn to a method that, unlike graphing and substitution, is generalizable to systems with more than two variables easily. There are a set of rules to follow when doing this

Theorem 1. *A system of linear equations is transformed into an equivalent system if*

(1) *two equations are interchanged*

(2) *an equation is multiplied by a nonzero constant*

(3) *a constant multiple of one equation is added to another equation.*

Example 3. *Solve the following system using elimination*

$$\begin{array}{rcrcr} 3x & - & 2y & = & 8 \\ 2x & + & 5y & = & -1 \end{array}$$

Solution.

Example 4. *Solve the system using elimination*

$$\begin{array}{rcrcl} 5x & - & 2y & = & 12 \\ 2x & + & 3y & = & 1 \end{array}$$

Section 5.2 - Systems of Linear Inequalities in Two Variables

Solving Systems of Linear Inequalities Graphically.

Definition 1 (Solution Region/Feasible Region)**.** *Given a system of inequalities, the* solution region *or* feasible region *consists of all points* (x, y) *which simultaneously satisfy all of the inequalities in the system.*

Example 5. *Solve the following system of linear inequalities graphically:*

$$\begin{array}{rcrcl} 3x & + & y & \leq & 21 \\ x & - & 2y & \leq & 0 \end{array}$$

Example 6. *Solve the following system of linear inequalities graphically:*

$$\begin{array}{rcrcl} 3x & + & y & \geq & 6 \\ x & - & 5y & \leq & 5 \end{array}$$

Definition 2 (Corner Point)**.** *A* corner point *of a solution region is a point in the solution region that is the intersection of two boundary lines.*

Example 7. *Solve the following system of linear inequalities graphically and find the corner points:*

$$\begin{array}{rcrcr} x & + & y & \leq & 10 \\ 5x & + & 3y & \geq & 15 \\ -2x & + & 3y & \leq & 15 \\ 2x & - & 5y & \leq & 6 \end{array}$$

Solution.

Example 8. *Solve the following system of linear inequalities graphically and find the corner points:*

$$\begin{array}{rcrcl} 5x & + & y & \geq & 20 \\ x & + & y & \geq & 12 \\ x & + & 3y & \geq & 18 \\ & & x & \geq & 0 \\ & & y & \geq & 0 \end{array}$$

Definition 3 (Bounded/Unbounded). *A solution region of a system of linear inequalities is* bounded *if it can be enclosed within a circle. If it cannot be enclosed within a circle, it is* unbounded.

Question. *Which of the regions in examples 1-4 are bounded? Which are unbounded?*