ALGEBRA PROBLEM SESSION # 5 - PRACTICE PROBLEMS

Linear Inequalities

1. When graphing the solutions of an inequality, what does a parenthesis signify? What does a bracket signify?

2. Solve, write your answer in interval notation and then graph:

   (a) $9(4x - 1) < 3(2x + 2)$

   (b) $12y + 6 < 9y + 8$

   (c) $12x + 3 \geq 10x + 5$

   (d) $8 - 21r \leq 11r + 5$

   (e) $11(7y - 5) > 2(y - 3)$

   (f) $16(r - 4) \leq 2(r - 7)$

   (g) $\frac{7}{4}(x+3) < \frac{3}{8}(x-3)$

Compound Inequalities

1. Explain the differences between solving an inequality involving *and* with an inequality involving *or*.

2. True or False: Compound inequalities with *and* have solutions that satisfy both inequalities, whereas compound inequalities with *or* have solutions that satisfy at least one of the inequalities.

3. Solve, write your answer in interval notation and then graph:

   (a) $6 > 2x - 1 > -2$

   (b) $15 > x - 4 \geq -18$

   (c) $-13 \leq 3x + 5 < 18$

   (d) $4x > 3x + 2 > x - 3$

   (e) $x + 3 \geq 5$ and $2x \leq 6$

   (f) $4y < 8$ or $y - 8 > 2$

   (g) $3x - 11 < 4$ or $4x + 9 \geq 1$

Selected problems were taken from Blitzer Algebra For College Students

Absolute Value Equations and Inequalities

1. Solve:
   $|x + 1| + 6 = 2$ $|5x - 8| = |3x - 2|$ $|3x - 2| > 0$
   $|-2x + 5| > 4$ $|3x - 1| - 7 > -11$

2. Explain whether or not the following strategy for solving $|x| > 5$ can be justified:
   Solve $|x| \leq 5$ and then the solutions to $|x| > 5$ are those real numbers that do not satisfy $|x| \leq 5$.

3. Under what conditions is $|x| + |y| > |x + y|$?

4. When, if ever, is $|a + b| = |a| + |b|$ true?

5. The point (2, 5) is on the boundary separating the regions determined by $y < 2x + 1$. Explain where all points (2, t), $t < 5$, would be located relative to the boundary.

6. Solve:
   (a) $|3x + 1| = 10$

   (b) $|5x - 4| = |4x - 5|$

   (c) $\left|\frac{3 - 2x}{2}\right| = \left|\frac{3x - 2}{3}\right|$

7. Solve the following, write your answer in interval notation and then graph:
   (a) $|2x + 7| < 3$ (b) $\left|\frac{1 - 5x}{3}\right| > 7$

8. Can an inequality be an identity, one that is satisfied by all (x, y) pairs? Illustrate.

9. Can an inequality have no solution? Illustrate, if possible.

Linear Inequalities in Two Variables

1. Explain how to decide where to draw the boundary of the graph of a linear inequality, and whether to draw it as a solid or a broken line.

2. Graph the following systems:
   $y \geq x + 1$ $4y - 5 > x$ $2y - 5 > x$ $2y + 4 \leq x$
   $3x + 2y < 6$ $3x + 7y < 0$ $3x - y < 1$ $y + x < 4$

   $2y + x < 3$ $x > 2y - 4$ $y + 2x < 4$
   $-y + 3 > x$ $y - x < 1$ $2y - x < 0$

3. Explain how to decide which side of the boundary of the graph of a linear inequality should be shaded.

4. Write a system of inequalities whose solution set includes every point in the rectangular coordinate system.

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