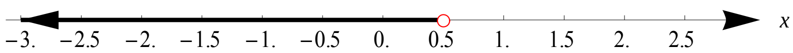
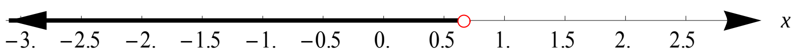
ALGEBRA PROBLEM SESSION #5 SOLUTIONS

Linear Inequalities

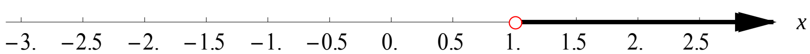
1. When graphing the solutions of an inequality, a parenthesis denotes that you are excluding the endpoint. When graphing the solutions of an inequality, a parenthesis denotes that you are including the endpoint.



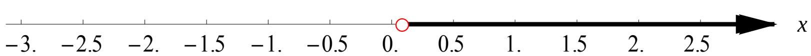
2. (a) $\left(-\infty, \frac{1}{2}\right)$



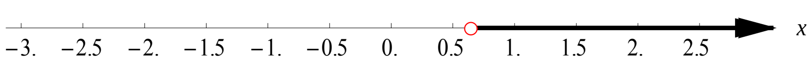
(b) $\left(-\infty, \frac{2}{3}\right)$



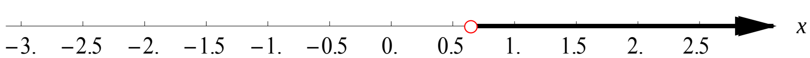
(c) $(1, \infty)$



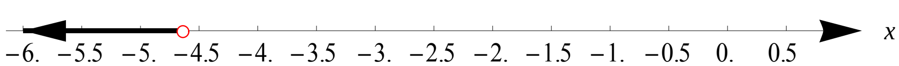
(d) $\left(\frac{3}{32}, \infty\right)$



(e) $\left(\frac{49}{75}, \infty\right)$



(f) $\left(-\infty, \frac{25}{7}\right)$

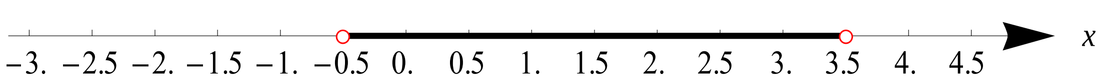


(g) $\left(-\infty, -\frac{51}{11}\right)$

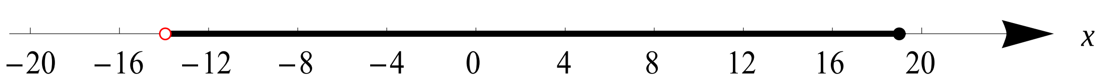
Compound Inequalities

1. 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.

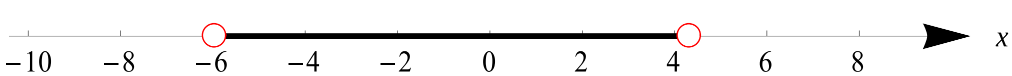
2. True.



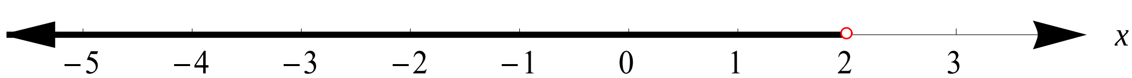
3. (a) $\left(-\frac{1}{2}, \frac{7}{2}\right)$



(b) $[-14, 19)$



(c) $\left[-6, \frac{13}{3}\right)$



(d) $(4, \infty)$

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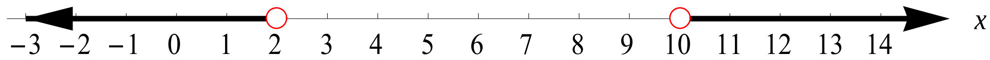
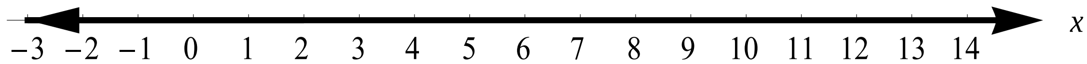
(e) $[2, 3]$



(f) $(-\infty, 2) \cup (10, \infty)$



(g) $(-2,\ 5)$

Absolute Value Equations and Inequalities

1. (a) No solution. (b) $x = \frac{5}{4}$ or $x = 3$ (c) $\left(-\infty, \frac{2}{3}\right) \cup \left(\frac{2}{3}, \infty\right)$
   (d) $\left(-\infty, \frac{1}{2}\right) \cup \left(\frac{9}{2}, \infty\right)$ (e) $\left(-\infty, \frac{1}{3}\right) \cup \left(\frac{1}{3}, \infty\right)$

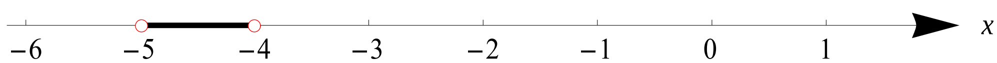
2. Yes, the strategy for solving $|x| > 5$ can be justified.

3. $|x| + |y| > |x + y|$ is true, when x and y are of different signs.

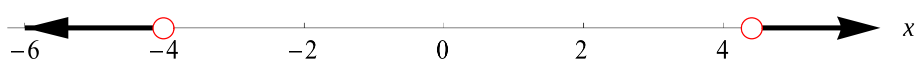
4. $|a + b| = |a| + |b|$ is true, if either $a = 0$ and/or $b = 0$ or a and b are of the same sign.

5. All the points $(2, t)$, $t < 5$, would be located on the line $x = 2$ below the boundary $y = 2x + 1$ separating the regions determined by $y < 2x + 1$.

6. (a) $x = -\frac{11}{3}$ or $x = 3$ (b) $x = -1$ or $x = 1$ (c) $x = \frac{13}{12}$



7. (a) $(-5, -2)$



   (b) $(-\infty, -4) \cup \left(\frac{22}{5}, \infty\right)$

(b) A compound inequality can be an identity, one that is satisfied by all (x, y) pairs? Illustrate.

(c) Can an inequality have no solution? Illustrate, if possible.

Linear Inequalities in Two Variables

1. Change the linear inequality into an equation by change the inequality sign into an equal sign. If the original inequality was a strict inequality, i.e. < or >, then the boundary is a broken line, if not the boundary is a solid line.

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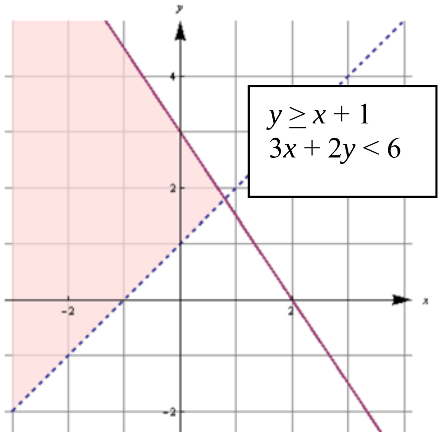
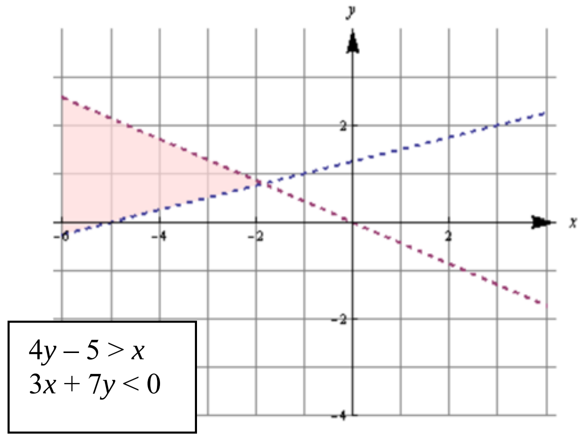
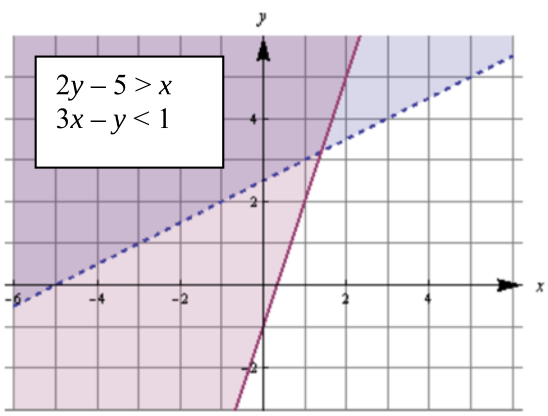
2. (a)



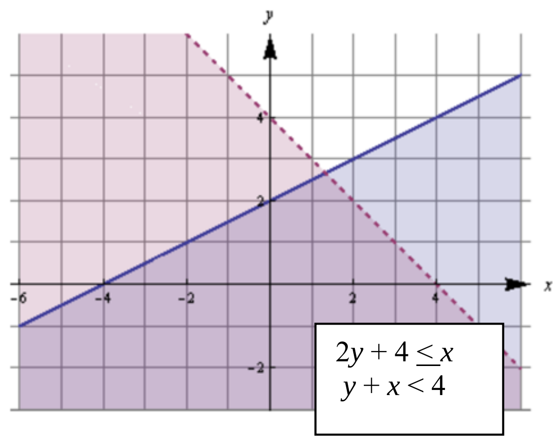
(b)



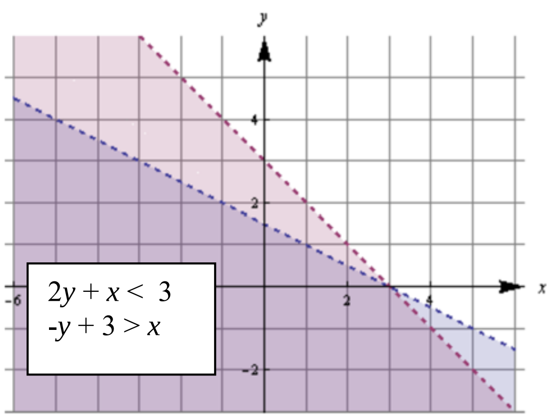
(c)



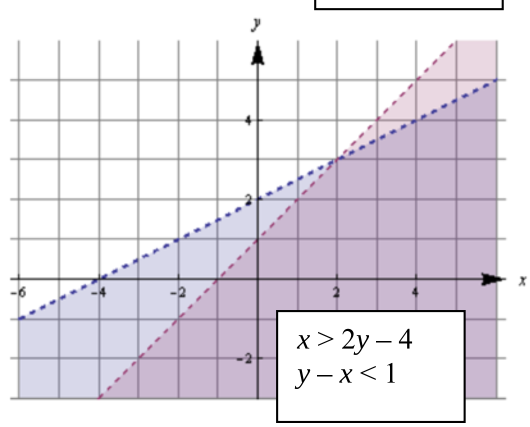
(d)



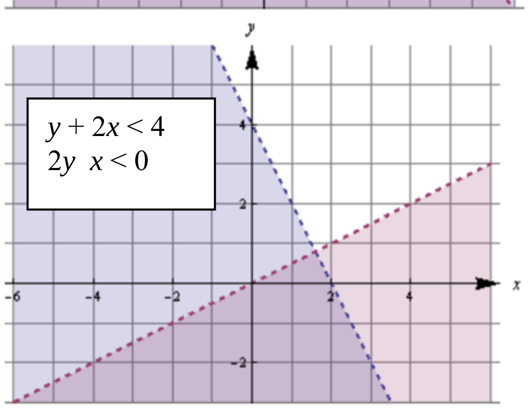
(e)



(f)



(g)



4. Answers will vary.
   Example $\begin{Bmatrix} y > x \\ y < x + 1 \end{Bmatrix}$

3. Pick a test point on one side of the boundary and check to see if it satisfies the inequality. If the point satisfies the inequality then the region that contains the test point is the solution of the inequality. If the test point does not satisfy the inequality then the other side of the boundary is the solution of the inequality.