Lesson 3.4: Linear Inequalities

By the end of the lesson, you will be able to:

~ Determine whether an ordered pair is a solution to a linear inequality.

~ Graph linear inequalities.

~ Solve problems involving linear inequalities.

Lesson 3.4: Linear Inequalities

Linear Inequalities in two variables are in one of the following forms:

$Ax + By < C$ $\qquad$ $Ax + By > C$

$Ax + By \leq C$ $\qquad$ $Ax + By \geq C$

If we replace the inequality sign with an equal sign, we obtain the equation of a line, $Ax + By = C$. The line separates the xy-plane into two regions called half planes.

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A linear inequalitiy in two variables x and y is satisfied by an ordered pair (a, b) if, when x is replaced by a and y is relpaced by b, a true statement results.

For Example:

$x + y < 10$ for (3, 5)

We replace x with 3 and y with 5.

$3 + 5 < 10$?

$8 < 10$ TRUE. The point (3, 5) satisfies the inequality.

Ex 1: Determine which of the following ordered pairs are solutions to the linear inequality.

$3x + y < 7$

a.) (2, 4)

$3(2)+4<7$?

$6+4<7$

$10<7$

False

b.) (-3, 1)

$3(-3)+1<7$?

$-9+1<7$

$-8<7$

True

c.) (1, 3)

$3(1)+3<7$?

$3+3<7$

$6<7$

True

Lesson 3.4: Linear Inequalities

To graph an inequalitiy:

~ We treat the inequality like a line (=) to graph.

~ A nonstrict inequality ($\leq$, $\geq$) will be a solid line

~ A strict inequality (<, >) will be a dashed line.

When we graph an inequalitiy, we follow these steps:

1. Graph the boundary (the line) - Determine whether it's a solid line ($\leq$, $\geq$) or dashed line ($<$, $>$).

2. Test a point in each region (half-plane).

3. Shade the region whose ordered pair result in a true inequality.

Ex 2: Graph $2y - 3x \leq 3$

$+3x \quad +3x$

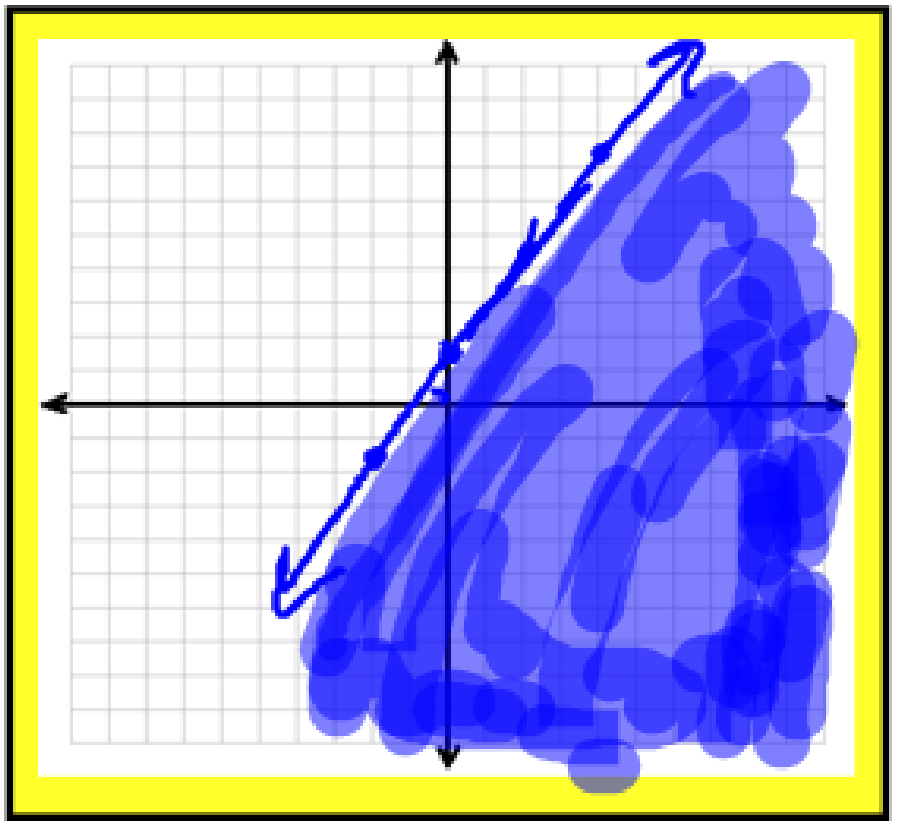
$\frac{2y}{2} \leq \frac{3x+3}{2}$

$y \leq \frac{3}{2}x + \frac{3}{2}$

Test (0,0)

$2(0) - 3(0) \leq 3$

$0 \leq 3$ ✓



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Ex 3: Graph $4x + 3y > 0$

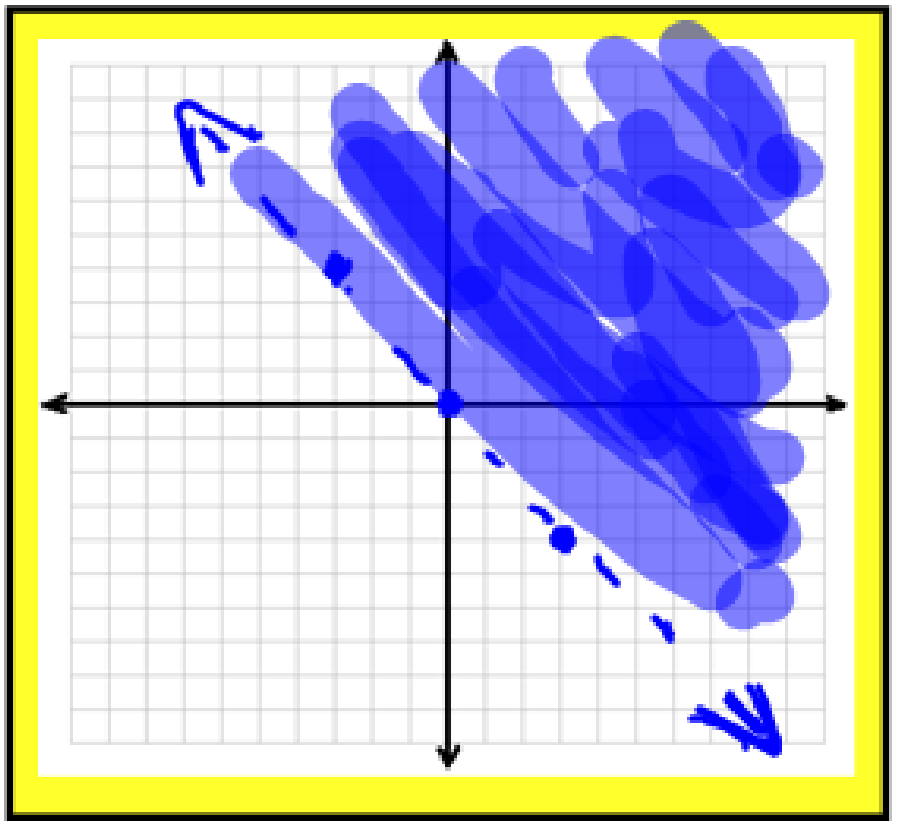
$$\frac{3y}{3} > \frac{-4x}{3}$$

$$y > -\frac{4}{3}x$$

Test: (1,1)

$4(1) + 3(1) > 0$

$7 > 0$ ✓



Lesson 3.4: Linear Inequalities

Solving problems involving Linear Inequalities:

Randy really enjoys Wendy's Junior Cheeseburger and Biggie French Fries. However, he knows that his intake of saturated fat during lunch should not exceed 16 grams. Each Junior Cheeseburger contains 6 grams of saturated fat and each Biggie Fries contains 3 grams of ~~saturated~~ ate fat.

≤

x = Cheeseburger
y = fries

a.) Write a linear inequality that describes Randy's options for eating at Wendy's. That is, write an inequality that represents all the combinations of Junior Cheeseburgers and Biggie Fries that Randy can order.

$6x + 3y \leq 16$

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Lesson 3.4: Linear Inequalities

Linear Inequality: $6x + 3y \leq 16$

b.) Can Randy eat 2 Junior Cheeseburgers and 1 Biggie Fry durning lunch and stay withing his allotment of saturated fat?

$6(2) + 3(1) \leq 16$

$12 + 3 \leq 16$

$15 \leq 16$ ✓

Yes, he can

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Linear Inequality: $6x + 3y \leq 16$

c.) Can Randy eat 3 Junior Cheeseburgers and 1 Biggie Fry during lunch and stay within his allotment of saturated fat?

$6(3) + 3(1) \leq 16$

$18 + 3 \leq 16$

NO

he can't

Homework:

Pg. 229: #'s 1-7 all, 9, 13, 19, 23, 29, 31

Graphs must be neat and accurate!