Algebra II Week 3 Quiz (ver. 2) Solutions

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September 12, 2024

Absolute Values and Inequalities (/40 points)

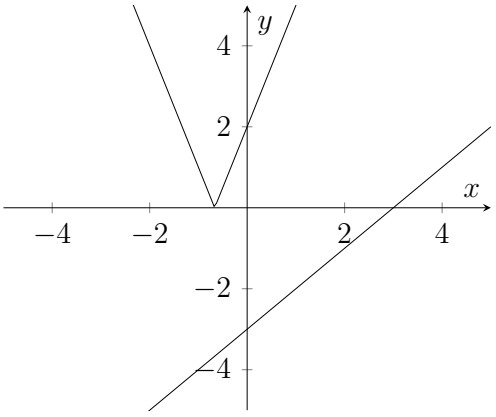
What is the solution set to the equation $|3x + 2| = x - 3$?

Check the positive and negative possibilities.

$$\begin{aligned} 3x + 2 &= x - 3 \\ 2x &= -5 \\ x &= -5/2 \end{aligned}$$ Positive version

$$\begin{aligned} 3x + 2 &= -x + 3 \\ 4x &= -1 \\ x &= -1/4 \end{aligned}$$ Negative version

Plugging these back into the equation, we get $5.5 \neq -5.5$ for the positive version, and we get $1.25 \neq -3.25$ for the negative version. So there is no solution. See the graph below.



What is the solution set to the inequality $|3x - 6| \geq -3$?

Because the absolute value function always returns values greater than or equal to zero, all real numbers are a solution to the above inequality.

What is the solution set to the inequality $-|5x - 15| \leq -20$?

First you must multiply by a -1 to isolate the absolute value term on the left. This multiplication will flip the direction of the inequality.

$$|5x - 15| \geq 20$$

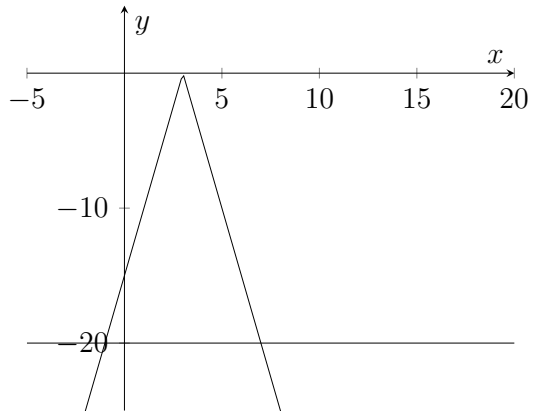
Check the positive and negative possibilities.

$$\begin{aligned} 5x - 15 &\geq 20 && \text{Positive version} \\ 5x &\geq 35 \\ x &\geq 7 \\ 5x - 15 &\leq -20 && \text{Negative version} \\ 5x &\leq -5 \\ x &\leq -1 \end{aligned}$$

Plugging these back into the equation, we get $20 = 20$ for the positive version, and we get $20 = 20$ for the negative version. So both are valid solutions. Putting the inequalities together, we arrive at the solution:

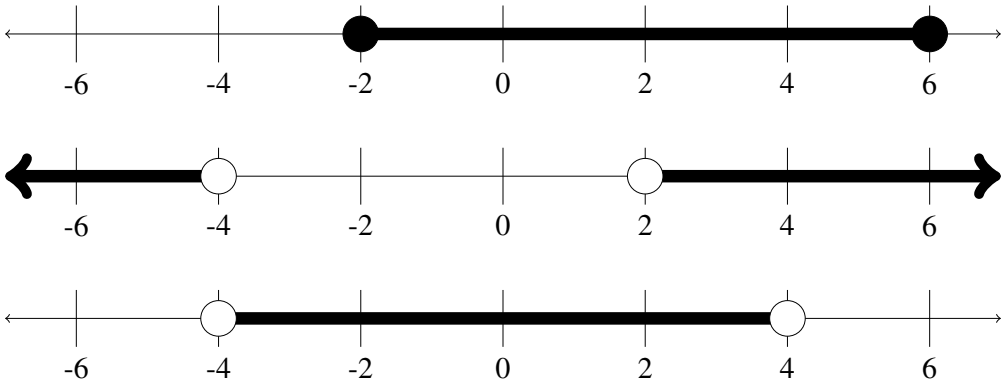
$$x \leq -1 \quad \text{or} \quad x \geq 7$$

See the graph below.



In the diagram below, I have graphed the solution sets according to 3 different inequalities involving **absolute values**. What are they?

$$|x-2| \leq 4 \quad (1)$$
$$|x+1| > 3 \quad (2)$$
$$|x| < 4 \quad (3)$$



Linear Functions (/30 points)

Provide the equation of the line in **Slope-Intercept Form** that satisfies the following conditions:

- Passes through the x-intercept at -4
- Is **parallel** to the line $6x + 3y = 9$

First find the slope needed.

$$6x + 3y = 9$$
$$3y = -6x + 9$$
$$y = -2x + 3$$
$$m = -2$$

Use point-slope form then rearrange.

$$y - y_1 = m(x - x_1)$$
$$y - 0 = -2(x - (-4))$$
$$y = -2x - 8$$

Provide the equation of the line in **Standard Form** that satisfies the following conditions:

- Goes through the point (2, 6)
- Is **perpendicular** to the line $y = 2x + 92$

First find the slope needed. To find the perpendicular slope, take the negative reciprocal of the slope given to you.

$$2 \rightarrow -1/2$$

Use point-slope form then rearrange.

$$y - y_1 = m(x - x_1)$$
$$y - 6 = -\frac{1}{2}(x - 2)$$
$$y - 6 = -\frac{1}{2}x + 1$$
$$\frac{1}{2}x + y = 7$$
$$x + 2y = 14$$

Sets, Relations, and Functions (/30 points)

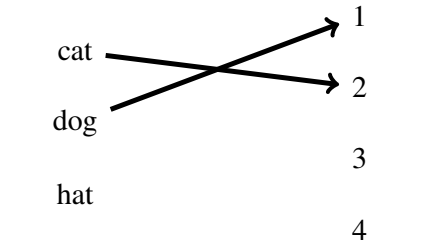
Write the definition of **relation**.

Formal definition. A relation from set A to set B is a set of ordered pairs (a, b) where a is an element of A and b is an element from B.
Note: The ordered pairs are exactly the arrows you see in the charts below.

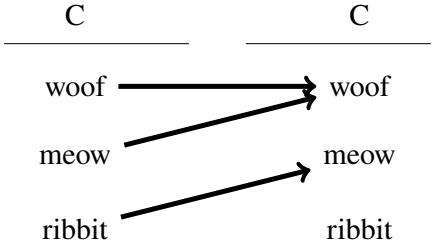
Write the definition of **function**.

Formal definition. A function from set A to set B is a relation such that every element of A has exactly one ordered pair containing it in the relation.

The relation R from A to B.



The relation S from C to C.



Which one is the **domain**? A

Which one is the **range**? B

Write out the elements of R.

$$R = \{(cat, 2), (dog, 1)\}$$

Is R a function from A to B? (**No**)
If not, explain why.

No, hat is not being sent anywhere.

What is $R(hat)$?

$R(hat)$ is $undefined$.

Is S a function from C to C? (**Yes**)
If not, explain why.

What is $S(S(ribbit))$?

$$S(S(ribbit)) = S(meow) = woof$$