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7.8. Advanced Algebra

DATE: 9/13

Introduction to Inverses

Suppose you are given the following directions:

- From home, go north on Rt 23 for 5 miles
- Turn east (right) onto Orchard Street
- Go to the 3rd traffic light and turn north (left) onto Avon Drive
- Tracy's house is the 5th house on the right.

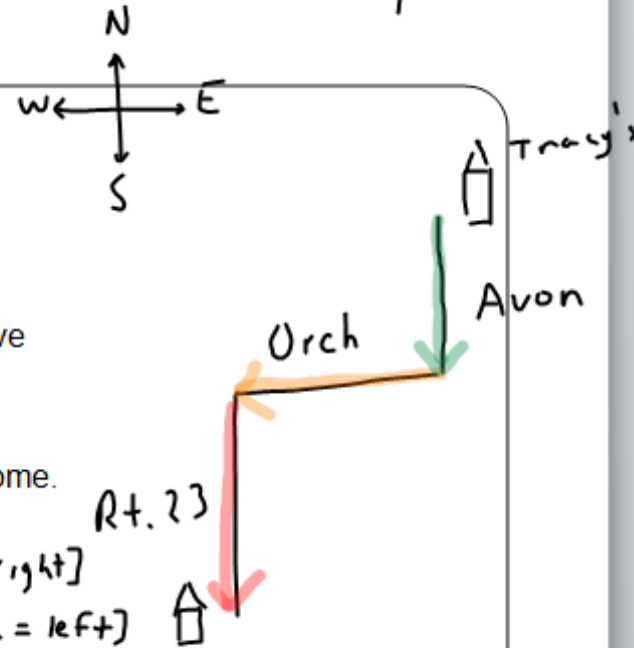
If you start from Tracy's house, write down the directions to get home.

- Head south on Avon until you hit Orchard.
 - Turn west on Orch until you hit Rt 23. [west = right]
 - Turn south on Rt. 23 and head for 5 miles [south = left]
1. How did you come up with the directions to get home from Tracy's?

I drew a pic and went backwards, "undoing" original directions

Now suppose you are given the following algorithm:

- Starting with a number, add 5 to it
- Divide the result by 3



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Now suppose you are given the following algorithm:

- Starting with a number, add 5 to it
- \otimes Divide the result by 3
- \oplus Subtract 4 from that quantity
- \div^2 Double your result

2. The final result is 10. Working backwards knowing this result, find the original number. Show your work.

Go backward: $\frac{10}{2} = 5$, $5 + 4 = 9$; $9 \times 3 = 27$; $27 - 5 = \boxed{22}$

3. Write a function $f(x)$, which when given a number x (the original number) will model the operations given above.

$$f(x) = 2\left(\frac{x+5}{3} - 4\right)$$

CHECK:

$$f(22) = 2\left(\frac{22+5}{3} - 4\right) = 2\left(\frac{27}{3} - 4\right) = 2(9-4) = 2(5) = 10 \checkmark$$

"Follow algorithm"

4. Write a function $g(x)$, which when given a number x (the final result), will model the backward algorithm that you came up with above.

Inverse of $f(x)$

$$g(x) = 3\left(\frac{x}{2} + 4\right) - 5$$

CHECK:

$$g(10) = 3\left(\frac{10}{2} + 4\right) - 5 = 3(5+4) - 5 = 3(9) - 5 = 27 - 5 = 22 \checkmark$$

Follow algorithm backward

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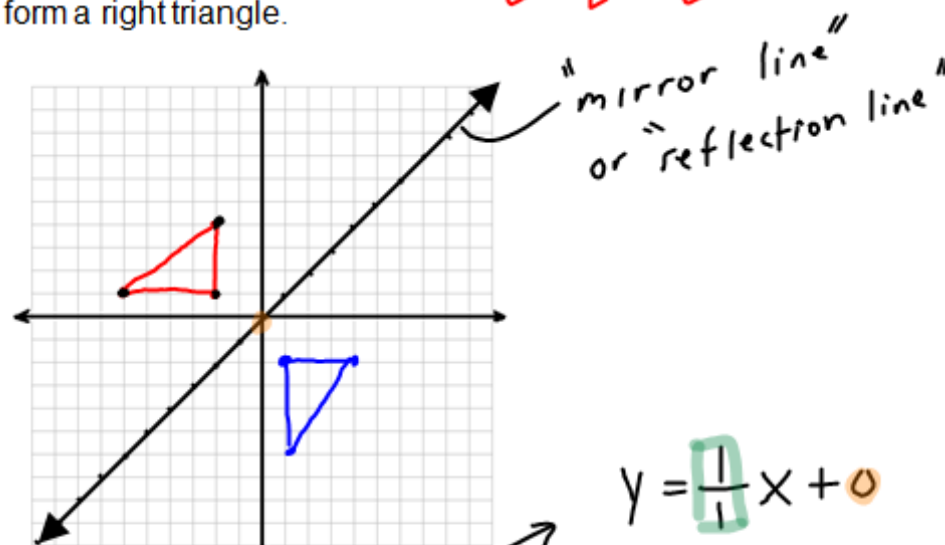
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Follow these directions:

1. Using the coordinate plane below, graph relation $A = \{(-2, 1), (-2, 4), (-6, 1)\}$. These points should form a right triangle.

2.



3. On the coordinate plane in #2, graph $y = x$.
4. Explanation: "An inverse is when the x -value and y -value are switched for each point within a relation." Using this explanation of inverse, write the inverse of A , which is written as A^{-1} . $A^{-1} = \{(1, -2), (4, -2), (1, -6)\}$.
5. Graph A^{-1} on the coordinate plane in #2.
6. Describe how the graph of A compares to the graph of its inverse, A^{-1} . Use the line $y = x$ to help you with your description.

A^{-1} (blue Δ) and A (red Δ) are reflections of each other over the mirror line.