Successive Discounts

NAME _____

Composition of functions involves applying two or more functions in succession.

One of the places that this topic occurs is in retail stores, when successive discounts are taken. Using this context, you will examine composition of functions.

In the mail, you receive a coupon for $5 off of a pair of jeans. When you arrive at the store, you find that all jeans are 25% off. You find a pair of jeans for $36.

1. If you use the $5 off coupon first, and then you use the 25% off on the remaining amount, how much will the jeans cost?

2. If you use the 25% off first, and then you use the $5 off on the remaining amount, how much will the jeans cost?

How will the situation change for jeans that cost more or less than $36?

3. Let the cost of the jeans be represented by a variable x. Write a function $f(x)$ that represents the cost of the jeans after the $5 off coupon.

4. Write a function $g(x)$ that represents the cost of the jeans after the 25% discount.

5. Write a new function $r(x)$ that represents the cost of the jeans if the 25% discount is applied first and the $5 off coupon is applied second.

6. Write a new function $s(x)$ that represents the cost of the jeans if the $5 off coupon is applied first and the 25% discount is applied second.

Examine a graphical representation of the situation.

7. Using the context of the cost of a pair of jeans, determine a reasonable domain for the problem situation.

8. Use your domain to determine an appropriate viewing window for the graphs of $y_1 = f(x)$ and $y_2 = g(x)$. Record the dimensions of your viewing window below.

9. Graph $y_1 = f(x)$ and $y_2 = g(x)$. Notice that their graphs intersect. Identify the point of intersection. Explain the meaning of the point of intersection as related to the cost of the jeans.

Graph equivalent functions.

10. Graph $y_3 = r(x)$. Explain how the graph of $y_3 = r(x)$ relates to the graphs of $y_1 = f(x)$ and $y_2 = g(x)$.

11. Using only y_1 and y_2, determine a function equivalent to $y_3 = r(x)$. Graph this function in the same viewing window as $y_1 = f(x)$, $y_2 = g(x)$, and $y_3 = r(x)$. Explain how you can use a graph to determine if your function is equivalent to $y_3 = r(x)$.

12. Graph $y_4 = s(x)$. Explain how the graph of $y_4 = s(x)$ relates to the graphs of $y_1 = f(x)$ and $y_2 = g(x)$.

13. Using only y_1 and y_2, determine a function equivalent to $y_4 = s(x)$. Graph this function in the same viewing window as $y_1 = f(x)$, $y_2 = g(x)$, and $y_4 = s(x)$. Explain how you can use a graph to determine if your function is equivalent to $y_4 = s(x)$.

14. If you want to pay the lowest possible sale price, should you apply the coupon first or the percent discount first? Discuss how you can use the graphs of $y_3 = r(x)$ and $y_4 = s(x)$ to support your answer.