Math 418: Worksheet 3

September 14, 2020

Directions: DO NOT DO YOUR WORK ON THIS SHEET. Justify ALL your answers.

1 Let $f(x) = 3(x-1)^2$. Find values for a, b, c and d so that the graph of $g(x) = af(bx+c)+d$ is the graph of f but, stretched vertically by a factor of 3, shifted down 2 units and stretched horizontally by a factor of 4 with a horizontal flip. Then fully simplify $g(x)$.

2 Let $f(x) = \frac{1}{2x}$. What transformations take $f(x)$ and to $g(x) = \frac{10}{3(x+7)}$?

3 Suppose $f(x)$ has domain [-1,3] and range [-2,5). Find the domain and range of $g(x) = 2f(x+3) - 5$.

4 Suppose $g(x) = 2x + 5$. Find a series of **horizontal** transformations taking $g(x)$ to $h(x) = x + 1$.

5 Suppose $g(x) = 2x + 5$. Find a series of **vertical** transformations taking $g(x)$ to $h(x) = x + 1$.

Definition: A **linear function** is a function that can be written in the form $ax+b$, with a and b real numbers. A **quadratic function** is a function that can be written in the form $ax^2 + bx + c$.

6 Suppose f and g are defined by the following tables.

x	$f(x)$
2	8
3	11
4	13
5	1

x	$g(x)$
1	2
2	4
3	4
4	5

a) Give a table for $z(x) = 3g(x) + 2$.

b) Give a table for $t(x) = g(x+2)$

c) Give a table for $p(x) = -2f(4x+1) - 3$

7 Toni has a cellular data plan that charged \$300 for the initial sign up and then \$65 per month after that. How much in total will Toni have to pay to keep this plan for a year? Write a function $C(m)$ which gives the total cost paid for having this plan for m months.

8 What is the slope of the line passing through $(1, 9)$ and $(2, 4)$?

9 What is the slope of the line passing through $(2, 4)$ and $(1, 9)$?

10 How do the answers to the previous two questions compare? Can you explain why they are related?

11 The lines $y = 5x - 7$ and $2x + 8y - 2 = 0$ intersect at a single point. What are the coordinates of that point?

12 Do the lines $y - 2 = 18(x + 1)$ and $y - 18x = 4$ intersect? If so, find the coordinates of the intersection. If not, explain how you know.

13 Give an equation of the line passing through the point $\left(1, \frac{2}{3}\right)$ that is parallel to $2x + 8y = 12$

14 Andy Student is working on a math problem. The problem asks Andy to find the slope of $3x + 12y = 13$. Andy says the slope is $m = 12$. Is Andy right or wrong? Justify your answer. What is the slope?

15 Give an equation of the line passing through the point $(\pi, 2)$ that is perpendicular to $y = \frac{-3}{4}x + 12$

16 Consider the diagram below. Note that figure B is obtained from figure A by simply moving around the red, blue, yellow and green shapes. Recall that the area of a triangle of height h and base b is $\frac{1}{2}bh$. Compute the area of figure A and figure B. How can you explain this discrepancy? Fully justify your argument.