WORKSHEET #6

Math 6A30, Fall 2020

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Instructions. You are encouraged to work with **(not copy)** your group, but each of you will turn in your own worksheet by the end of the day (11:59 pm) via Gradescope. You may ask the TA a few questions, which the TA will answer with leading questions (not answers) to help guide you.

Log in to www.Gradescope.com with your UCRNetID@ucr.edu email to submit your worksheet.

Instructions for clear submissions. If you can, write on the worksheet. If you cannot, then write your solutions to page 1 of the worksheet on one paper and your solutions to page 2 of the worksheet on a second paper. Clearly label each question. **Scan** your work with a scanning tool to **pdf** and upload it to Gradescope. **Your submission should be clear, easy to read, no shadows with each of your pages submitted to the correct page on Gradescope.** If it is not, then resubmit. Worksheet is **15** points *(-2 for unclear submissions).*

Question 1 (6 points) This table completely describes the functions f and g. Use the table to evaluate the following quantities. If the expression cannot be evaluated, write DNE (Does Not Exist).

x	f(x)	g(x)
-2	0	2
-1	3	3
0	4	2
1	-1	0
2	-3	-1
3	-2	1

(a). $f(g(0)) =$ -3 $\quad g(f(2)) =$ DNE

(b). $f(f(3)) =$ 0 $\quad f(f(f(-1))) =$ 0

(c). If $g(x) = 2$, then $x =$ 0, -2

(d). If $f(g(x)) = 4$, then $x =$ 1

(e). If $g(f(x)) = -2$, then $x =$ DNE

(f). Does f have an inverse function? Does g have an inverse function? Justify.

horizontal line test

f(x) does have an inverse function b/c it passes the horizontal line test. g(x) doesn't because there are two outputs that are the same.

Question 2 (2 points) Let $a(x) = \sqrt{x-1} + 2$ and $b(x) = x + 5$.

(a). (1 point) What does $a(b(x))$ equal? Simplify as much as possible.

$\sqrt{(x+5)-1} + 2$

$\sqrt{x+4} + 2$

(b). (1 point) What is the domain of $a(b(x))$? Justify.

$[-4, \infty) \rightarrow$ Domain $\quad \sqrt{-4+4} + 2 \quad (-4, 2)$

$[2, \infty) \rightarrow$ Range $\quad \sqrt{0} + 2$

$0 + 2 = 2$

Question 3 (3 points) Your friend finds that the inverse of $h(x) = \frac{2x+5}{3}$ is $g(x) = \frac{3}{2}x - 5$.

(a). (2 points) Are they correct? Justify by demonstrating that they are correct or by finding the inverse of $h(x)$.

No ~~g~~(x) is not the inverse of h(x) as seen

$3 \quad x = \frac{2y+5}{3}$

$3x = 2y+5$

$\frac{3x-5}{2} = \frac{2y}{2} \rightarrow y = \frac{3x-5}{2}$

(b). (1 point) Evaluate these, where $h^{-1}(x)$ denotes the inverse function to $h(x)$:

$h(g(0)) =$ $-5/3$ $\qquad$ $h(h^{-1}(1234)) =$ 1234

$\frac{2(-5)+5}{3} \rightarrow \frac{-10+5}{3} \rightarrow \frac{-5}{3}$ $\qquad$ $\frac{3(1234)-5}{2} = 1848.5$

Question 4 (4 points) The volume of a sphere (in cm^3) can be expressed as function of the radius of the sphere (in cm) as follows: $V = f(r) = \frac{4}{3}\pi r^3$.

(a). (1 point) **Verbally interpret** what $f^{-1}(100)$ means in context (not symbolically/numerically).

$V = f(r) = \frac{4}{3}\pi r^3$

$r = \frac{4}{3}\pi y^3$ $\qquad$ $\sqrt[3]{\frac{3r}{4\pi}} = \sqrt[3]{y^3}$ $\qquad$ $f(r)^{-1} = \sqrt[3]{\frac{3r}{4\pi}}$

$3r = 4\pi y^3$

The radius and would equal to the volume.

(b). (1 point) In context, what is the domain and range of f? What does this say about the domain and range of f^{-1}?

f → Domain $(-\infty, \infty)$
Range $(-\infty, \infty)$

This means that f^{-1} would be $(-\infty, \infty)$ for both domain & range

(c). (2 points) Does $f(r)$ have an inverse function? If so, find $f^{-1}(V)$. If not, why not?

No, because it would be $f^{-1}(r)$ not $f^{-1}(V)$.