Assignment 1. MA 1125

Q1, f, g both 1-1.

$f+g$ need not be 1-1

example $f = x$ $g = -x$.

$f \cdot g$ need not be 1-1.

$f(x) = x$ on $[1, 2]$ $g(x) = \frac{1}{x}$ on $[1, 2]$.

$f \circ g$ will be 1-1.

$f \circ g(x_1) = f \circ g(x_2)$

$\Rightarrow f(g(x_1)) = f(g(x_2))$ by def

$\Rightarrow g(x_1) = g(x_2)$ by f is 1-1

$\Rightarrow x_1 = x_2$ by g is 1-1.

f, g both onto

$f+g$ need not be + $f \cdot g$ need not be
same examples as above.

$f \circ g$ is onto.

$f : X \to Y$ $g : Z \to X$.

$f \circ g : Z \to Y$ Let y in Y.

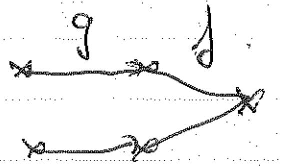
f is onto $\Rightarrow \exists x$ s.t $f(x) = y$.

g is onto $\Rightarrow \exists z$ s.t $g(z) = x$.

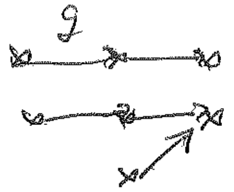
then $f \circ g(z) = f(g(z)) = y$

Q2 $f \circ g$ is 1–1 $\Rightarrow$ g is 1–1.

But g is 1–1 $\not\Rightarrow$ $f \circ g$ is 1–1.

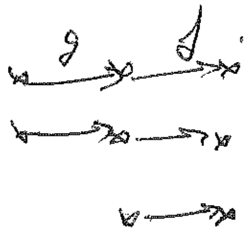
Example 

$f \circ g$ is 1–1 $\not\Rightarrow$ f is 1–1.

Example 

Q 3 $f \circ g$ is onto $\Rightarrow$ f is onto

But f is onto $\not\Rightarrow$ $f \circ g$ is onto.

Example 

and $f \circ g$ is onto $\not\Rightarrow$ g is onto

Example Same as last.

Q.4. f, g even $\quad (f+g)(-x) = f(-x) + g(-x)$
$= f(x) + g(x)$
$= (f+g)(x)$

Sim. f, g odd $\Rightarrow$ $f+g$ is odd.

f, g even $\Rightarrow$ $f \cdot g$ even ✓
f, g odd $\Rightarrow$ $f \cdot g$ even ✓
f even, g odd $\Rightarrow$ $f+g$ can be anything!

f even g even $\quad f \circ g(-x) = f(g(-x))$
f even g odd $\quad = f(g(x)) = f \circ g(x)$ $\underline{E}$
$f \circ g(-x) = f(-g(x)) = fg(x)$ $\underline{E}$

f odd, g odd $\quad f\circ g(-x) = f(g(-x))$

$= f(-(g(x)))$

$= -f(g(x))$

$= -f\circ g(x) \quad \underline{\underline{O}}$.

Q5. $\quad y = \dfrac{2x+1}{x-1} \qquad x \neq 1.$

$y(x-1) = 2x+1.$

$x(y-2) = 1+y$

$x = \dfrac{1+y}{y-2} \qquad y \neq 2.$

Check $\quad x = \dfrac{1+y}{y-2} = \dfrac{1+\frac{2x+1}{x-1}}{\frac{2x+1}{x-1}-2}$

$= \dfrac{x-1+2x+1}{2x+1-2x+2}$

$= \dfrac{3x}{3} = x$ ✓.

Check other way.

$y = \dfrac{2x+1}{x-1} =$