1. (2 pts) If \( f(x) = \frac{1}{\sqrt{x+1}} \) and \( g(x) = (x - 1)^2 \), find the following function and its domain:

\[
(g \circ f)(x) = g(f(x)) = g\left(\frac{1}{\sqrt{x+1}}\right)
\]

\[
= \left(\frac{1}{\sqrt{x+1}} - 1\right)^2
\]

\[
= \left(\frac{1}{\sqrt{x+1}} - \frac{\sqrt{x+1}}{\sqrt{x+1}}\right)^2
\]

\[
= \left(\frac{1 - \sqrt{x+1}}{\sqrt{x+1}}\right)^2
\]

Domain of \( f \): \((0, \infty)\)

Domain of \( g \): \((\infty, 0)\)

Domain of \( g \circ f \): \((0, \infty)\)

2. (3 pts) Find the inverse of \( f(x) = \frac{x-1}{2x+1} \). Also indicate the domain and range of both \( f \) and \( f^{-1} \).

\[
y = \frac{x-1}{2x+1}
\]

\[
x + 1 = y(1-2x)
\]

\[
x = \frac{y-1}{2y+1}
\]

\[
x + 1 = y \frac{1-2x}{y}
\]

\[
x(2y+1) = y-1
\]

\[
2xy + x = y - 1
\]

\[
x + 1 = y - 2xy
\]

Domain of \( f \) = Range of \( f^{-1} \) = \((-\infty, -\frac{1}{2}) U (-\frac{1}{2}, \infty)\)

Domain of \( f^{-1} \) = Range of \( f \) = \((-\infty, -\frac{1}{2}) U (-\frac{1}{2}, \infty)\)

3. (2 pts) Let \( f(x) = \sqrt[3]{3x - 1} \) and \( g(x) \) be a one to one function such that \( g^{-1}(5) = 2 \) and the point \((4, -1)\) lies on the graph of \( g(x) \). Find the following:

\[
f(g(2))
\]

\[
g^{-1}(5) = 2 \iff g(2) = 5
\]

\[
f(g(2)) = f(5) = \sqrt[3]{3(5) - 1} = \sqrt[3]{15 - 1} = \sqrt[3]{14}
\]

\[
f(g(2)) = \frac{3}{\sqrt[3]{14}}
\]

University of Florida Honor Code:

On my honor, I have neither given nor received unauthorized aid in doing this assignment.

Signature