Directions: Please answer the following questions and make sure your answer are legible. You must show your work to receive credit for your answers. You may not use a calculator (or any other technology) on this quiz. Good Luck.

1. (7 points) Working together, Daniel and Donnie can clean the llama pen in 45 minutes. On his own, Daniel can clean the pen in an hour. How long does it take Donnie to clean the llama pen on his own?

\[
\begin{align*}
\text{Da} & \quad \text{blow} \quad \frac{1}{60} \\
\text{Do} & \quad \frac{1}{10} \\
\text{Together} & \quad \frac{1}{45}
\end{align*}
\]

\[D = \text{time Donnie to clean alone}\]

\[
\begin{align*}
\text{Fraction of Job Done in 1 min} & = \frac{1}{60} + \frac{1}{10} = \frac{1}{45} \\
D + 60 & = \frac{60D}{45} \\
1D + 60 & = \frac{4}{3}D \\
60 & = \frac{1}{3}D \\
180 & = D
\end{align*}
\]

2. (3 points) Let \( f(x) = \frac{3}{1-x} \) and \( g(x) = \frac{4x}{x^2 + 1} \).

(a) Find \( (g \circ f)(0) \)

\[g(f(0)) = g(3) = \frac{4 \cdot \frac{3}{4} + 1}{\frac{3}{4} + 1} = \frac{13}{5} = \frac{13}{5}\]

(b) Find \( (f \circ g)(\frac{1}{2}) \)

\[f(g(\frac{1}{2})) = f\left(\left(\frac{2}{3}\right)^2 + 1\right) = f\left(\frac{3}{4}\right) = f \left(\frac{2}{3}\right)\]

\[= f\left(\frac{2}{3}\right) = \frac{2}{1 - \frac{2}{3}} = \frac{2}{\frac{1}{3}} = \frac{2}{\frac{1}{3}} = \left(-5\right)\]

There’s Still More Quiz
3. (6 points) Let \( f(x) = |x| \) and \( g(x) = \sqrt{4-x} \).

Find a simple expression for \( g(f(x)) \) and write its domain using interval notation.

\[
g(f(x)) = g(1x1) = \sqrt{4-1x1}
\]

\[
\text{Domain } [-4, 4]
\]

4. For \( f(x) = \frac{2x - 1}{3x + 4} \)

(a) (3 points) Show that \( f(x) \) is one-to-one.

(b) (4 points) Find \( f^{-1}(x) \), simplify your answer.

(c) (1 point) Find the domain and range of \( f \), use interval notation.

(d) (1 point) Find the domain and range of \( f^{-1} \), use interval notation.