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. (3 points) Let \( f(x) = |x| \) and \( g(x) = \frac{1}{x^2 + 1} \), compute \( f(f(1)) - g(f(2)) \) \((\#17 \text{ in 6.1})\)

\[
\begin{align*}
  f(f(1)) &= f(1) = f(1) = 1 \\
  g(f(2)) &= g(\frac{1}{2}) = g(\frac{1}{2}) = \frac{1}{4 + 1} = \frac{1}{5}
\end{align*}
\]

\[
\begin{align*}
  f(f(1)) - g(f(2)) &= 1 - \frac{1}{5} = \frac{4}{5}
\end{align*}
\]

2. (5 points) Let \( f(x) = \frac{x}{x + 3} \) and \( g(x) = \frac{2}{x} \) and let \( h(x) = g(f(x)) \). \((\#38 \text{ in 6.1})\)

(a) Find a simplified expression for the composite function \( h(x) \).

(b) Find the domain of \( h(x) \). Give your answer in interval notation.

\[
\begin{align*}
  h(x) &= g(f(x)) = g\left(\frac{x}{x+3}\right) \\
  &= \frac{2}{\frac{x}{x+3}} = \frac{2(x+3)}{x} \\
  &= \frac{2x+6}{x}
\end{align*}
\]

3. (2 points) The domain of a one-to-one function \( f \) is \([5, \infty)\) and its range is \([-2, \infty)\). State the domain and range of \( f^{-1} \). \((\#77 \text{ in 6.2})\)

**Domain** \( f^{-1} = \text{Range of } f = [-3, \infty) \)

**Range** \( f^{-1} = \text{Domain of } f = [5, \infty) \)

There are Questions on the Back!
4. (4 points) Let $f(x) = \frac{3x + 4}{2x - 3}$. Find $f^{-1}(x)$.

$$Y = \frac{3x + 4}{2x - 3}$$

+ switch x/y

$$X = \frac{3Y + 4}{2Y - 3} \quad \text{+ solve for} \quad Y$$

$$2xY - 3x = 3Y + 4$$

$$2xY - 3Y = 3x + 4$$

$$Y(2x - 3) = 3x + 4$$

$$f^{-1}(x) = \frac{3x + 4}{2x - 3}$$

5. (4 points) Solve the equation $4^x \cdot 2^{x^2} = 16^2$.

$$4^x \cdot 2^{x^2} = 16^2$$

$$(2^2)^x \cdot 2^{x^2} = (2^4)^2$$

$$(x + 4)(x - 3) = 0$$

$$\{ -4, 3 \}$$

6. (2 points) If $5^{-x} = 3$, what does $5^{3x}$ equal?

$$5^{3x} = (5^x)^3 = (5^{-x})^{-3} = 3^{-3} = \frac{1}{3^3} = \frac{1}{27}$$