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. GoodLuck.

1. (3 points) Let \( f(x) = x^2 + 1 \) and \( g(x) = \frac{1}{x^2 + 1} \). Find the following and simplify your answers: 
   \( (1.5 \# 10) \)
   (a) \((g - f)(1) = g(1) - f(1) = \left(\frac{1}{1^2 + 1}\right) - (1^2 + 1) = \frac{1}{2} - 2 = -1.5 \)
   (b) \((fg)(\frac{1}{2}) = f\left(\frac{1}{2}\right) \cdot g\left(\frac{1}{2}\right) = \left(\frac{1}{2^2 + 1}\right) \cdot \left(\frac{\frac{1}{2}}{\frac{1}{2^2 + 1}}\right) = \frac{1}{3} \cdot \frac{1}{2} = \frac{1}{6} \)
   (c) \((\frac{g}{f})(-2) = \frac{g(-2)}{f(-2)} = \frac{-\frac{1}{2^2 + 1}}{-\frac{2^2 + 1}{2^2 + 1}} = \frac{1}{3} = \frac{1}{2.5} \)

2. (7 points) Let \( f(x) = \sqrt{x - 5} \) and \( g(x) = \sqrt{x - 5} \). Find the domain of \((\frac{f}{g})(x)\) (write your 
answer in interval notation) and find a simplified expression for \((\frac{f}{g})(x)\). \( (1.5 \# 20) \)

   \( \left(\frac{f}{g}\right)(x) = \frac{\sqrt{x - 5}}{\sqrt{x - 5}} \)

   Domain: \((5, \infty)\)

   \( \frac{x - 5}{x - 5} \geq 0 \)

   \( x - 5 \geq 0 \)

   \( x \geq 5 \)

   \( x = 5 \)

   \( x > 5 \)

3. (5 points) Let \( f(x) = \frac{3x}{x + 1} \). Find and simplify the difference quotient \( \frac{f(x + h) - f(x)}{h} \). 
   \( (1.5 \# 36) \)

   \( \text{DQ} = \frac{f(x + h) - f(x)}{h} = \frac{\frac{3(x + h)}{x + h + 1} - \frac{3x}{x + 1}}{h} = \frac{3(x + h)(x + 1) - 3x(x + h + 1)}{(x + h + 1)(x + 1)} \)

   \( = \frac{3(x^2 + xh + x + h) - 3x^2 - 3xh - 3x}{(x + h + 1)(x + 1)} \)

   \( \frac{3h}{(x + h + 1)(x + 1)} \)

More Questions on the Back
4. (6 points) Sketch the graph of the piecewise function

\[ f(x) = \begin{cases} 
-2x - 4 & \text{if } x < 0 \\
3x & \text{if } x \geq 0
\end{cases} \]

5. (4 points) Let \( f(x) = \frac{9}{\sqrt{4 - x^2}} \). Determine analytically if \( f(x) \) is even, odd or neither.

\[
f(-x) = \frac{9}{\sqrt{4 - (-x)^2}} = \frac{9}{\sqrt{4 - x^2}} = f(x)
\]

So \( f(x) \) is even.