1. Let \( f(x) = x^2 - x \) and let \( g(x) = 3x + 4 \).
   
   (a) (3pt) Find and simplify \((f \circ g)(x)\).
   
   **Answer:** \((f \circ g)(x) = 9x^2 + 21x + 12\)

   (b) (3pt) Find and simplify \((g \circ f)(x)\).
   
   **Answer:** \((g \circ f)(x) = 3x^2 - 3x + 4\)

2. (4pt) The function \( h(x) = 3 + 5 \ln(x-1) \) is invertible. Find and simplify its inverse.
   
   **Answer:** \( h^{-1}(y) = 1 + e^{\frac{1}{5}(y-3)} \)

3. **This problem has been corrected since it was administered in class. The change is highlighted in blue and underlined.**

   An engineer notices that a chemical is leaking from a pipe. This leak causes a steady accumulation of the chemical on the floor in the shape of a circle which is slowly growing outward. He records that \( t \) minutes after he noticed the leak, the circle has a radius of \( R(t) \) cm where

   \[ R(t) = 3 + \frac{1}{2} t. \]

   Of course, the area of a circle of radius \( r \) cm is \( A(r) \) cm\(^2\) where

   \[ A(r) = \pi r^2. \]

   (a) (5pt) Find a function \( Q \) such that \( t \) minutes after the engineer noticed the leak, the area of the accumulated chemical is \( Q(t) \) cm\(^2\).
   
   **Answer:** \( Q(t) = \frac{25}{4} t^2 + 3\pi t + 9\pi \)

   (b) (5pt) Find a function \( f \) such that when the radius of the circle of accumulated chemical is \( r \) cm it has been \( f(r) \) minutes since the engineer noticed the leak.

   **Answer:** \( f(r) = 2r - 6 \)