MAT1001 Quiz 9 - Version 1
Time: 15 Minutes

Student Name: _____ Student ID: _____

1. [8 Points] Let f and g be functions such that the composite function $g \circ f$ is defined. Determine whether the following statements are true or false in general. If your answer is true, no justification is needed. If your answer is false, provide a counterexample.

   (a) If $g \circ f$ is injective, then so is f.

   (b) If f is injective, then so is $g \circ f$.

2. [5+5 Points] Consider the function

$$f(x) = x^3 - 3x^2 - 1,$$

defined on $D = [2, \infty)$.

   (a) Show that f has an inverse function f^{-1}.

   (b) Find $(f^{-1})'(-1)$.

3. [5+5 Points]

(a) Evaluate the indefinite integral

$$\int \frac{3\sec^2 t}{6+3\tan t}dt.$$

(b) Use logarithmic differentiation to find dy/dx, where

$$y = \sqrt{\frac{(x+1)^{10}}{(2x+1)^5}}.$$

You do not need to simplify your answer.