Quiz 0 Solutions, Math 112, Section 2 (Vinroot)
Compute each of the following. Show all of your steps clearly.

(a): \( \int \sec^2 x \tan^3 x \, dx \)

Solution: Let \( u = \tan x \). Then, in the integral, \( du = \sec^2 x \, dx \), since \( \frac{d}{dx}(\tan x) = \sec^2 x \). With this substitution, the integral becomes
\[
\int \sec^2 x \tan^3 x \, dx = \int u^3 \, du = \frac{1}{4} u^4 + C = \frac{1}{4} \tan^4 x + C.
\]

(b): \( \int_0^2 \frac{1}{3t + 2} \, dt \)

Solution: Let \( u = 3t + 2 \), so that \( du = 3 \, dt \), so \( dt = \frac{1}{3} \, du \). When \( t = 0 \), \( u = 3(0) + 2 = 2 \), and then \( t = 2 \), \( u = 3(2) + 2 = 8 \). So, after this substitution the definite integral becomes
\[
\int_2^8 \frac{1}{3} \, du = \left[ \frac{1}{3} \ln |u| \right]_2^8 = \frac{1}{3} \ln 8 - \frac{1}{3} \ln 2 = \frac{1}{3} \ln \left( \frac{8}{2} \right) = \frac{1}{3} \ln 4.
\]