Quiz 0 **Solutions**, Math 112, Section 2 (Vinroot)

Compute each of the following. Show all of your steps clearly.

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

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): $\displaystyle\int_0^2 \frac{1}{3t+2} \, dt$

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

$$\int_2^8 \frac{1}{3}\frac{1}{u} \, du = \left[\frac{1}{3}\ln|u|\right]_2^8 = \frac{1}{3}\ln 8 - \frac{1}{3}\ln 2 = \frac{1}{3}\ln\left(\frac{8}{2}\right) = \frac{1}{3}\ln 4.$$