Math 150 Quiz 9 Solutions Fall 2011

Name: _____

NO CALCULATORS

1. [5 points each] Find the folowing indefinite integrals. Clearly indicate any substitutions you use.

   a. $\int \sec 3x \tan 3x \, dx = \frac{1}{3}\int \sec u \tan u \, du = \frac{1}{3}\sec u + C = \frac{1}{3}\sec 3x + C.$

   Let $u = 3x$. Then $du = 3dx$.

   b. $\int x^3 \sin x^4 \, dx = \frac{1}{4}\int \sin(x^4)\, 4x^3 dx = \frac{1}{4}\int \sin u \, du = \frac{-1}{4}\cos u + C$ $= \frac{-1}{4}\cos x^4 + C.$

   Let $u = x^4$. Then $du = 4x^3 \, dx$.

   c. $\int \frac{e^x}{e^x + 1} \, dx = \int \frac{1}{u} \, du = \ln|u| + C = \ln(e^x + 1) + C.$

   Let $u = e^x + 1$. Then $du = e^x dx$.

   d. $\int \tan x \, dx = \int \frac{\sin x}{\cos x} \, dx = \int \frac{-1}{u} \, du = -\ln|u| + C = -\ln|\cos x| + C$ $= \ln|\sec x| + C.$

   Let $u = \cos x$. Then $du = -\sin x \, dx$

   e. $\int x\sqrt{x^2 + 7} \, dx = \frac{1}{2}\int \sqrt{u} \, du = \frac{1}{2}\frac{u^{\frac{3}{2}}}{\frac{3}{2}} + C = \frac{1}{3}(x^2 + 7)^{\frac{3}{2}} + C.$

   Let $u = x^2 + 7$. Then $du = 2x \, dx$.