

PRINT Your Name: \_\_\_\_\_

**Quiz 2 — September 1, 2010 – Section 10 – 11:15 – 12:05**

**Remove everything from your desk except this page and a pencil or pen.**

Circle your answer. **Show your work.**

The quiz is worth 5 points.

Find  $\int \tan^5 x dx$ .

**Answer:** Save  $\tan x$ . Convert the remaining  $\tan^4 x$  to  $\sec x$ 's using  $\tan^2 x + 1 = \sec^2 x$ . Let  $u = \sec x$ . It follows that  $du = \sec x \tan x dx$ . The original problem is equal to

$$\begin{aligned} \int (\sec^2 x - 1)^2 \tan x dx &= \int \frac{(u^2 - 1)^2}{u} du = \int (u^3 - 2u + \frac{1}{u}) du \\ &= \frac{u^4}{4} - 2u^2 + \ln |u| + C = \boxed{\frac{\sec^4 x}{4} - \sec^2 x + \ln |\sec x| + C}. \end{aligned}$$

Check. The derivative of the proposed answer is

$$\begin{aligned} \sec^3 x \sec x \tan x - 2 \sec x \sec x \tan x + \tan x &= \tan x (\sec^4 x - 2 \sec^2 x + 1) = \\ \tan x (\sec^2 x - 1)^2 &= \tan x \tan^4 x. \checkmark \end{aligned}$$