

QUIZ 1 FOR CALC4 ON SEP. 4, 2014

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1. Compute  $\int \sin 2t \sec^2 2t dt$

Way 1: Substitution:

$$\int \sin 2t \sec^2 2t dt = \int \frac{\sin 2t}{\cos^2 2t} dt$$

$$\left\{ \begin{array}{l} u = \cos 2t. \quad du = -2 \sin 2t dt \\ \Rightarrow \int -\frac{1}{2} \cdot \frac{1}{u^2} du. \quad \left( \begin{array}{l} \sin 2t dt \Rightarrow \\ = -\frac{1}{2} du. \end{array} \right) \end{array} \right.$$

$$= \frac{1}{2} \cdot \frac{1}{u} + C = \frac{1}{2 \cos 2t} + C.$$

Way 2: Int. by parts.

$$\int \sin 2t \sec^2 2t dt = \int \sin 2t \cdot \frac{1}{\cos^2 2t} dt$$

DIFF      INT

$$= \sin 2t \left( \frac{1}{\cos 2t} \right) - \int (\cos 2t) \left( \frac{1}{\cos^2 2t} \right) dt$$

$$= \frac{1}{2} \sin 2t \tan 2t - \int \cos 2t \cdot \frac{\sin 2t}{\cos 2t} dt$$

$$= \frac{1}{2} \sin 2t \tan 2t + \frac{1}{2} \cos 2t + C.$$

Remark:  $\frac{1}{2} \sin 2t \tan 2t + \frac{1}{2} \cos 2t = \frac{1}{2} \left( \frac{\sin^2 2t}{\cos 2t} + \frac{1}{\cos 2t} \right) = \frac{1}{2} \frac{\sin^2 2t + \cos^2 2t}{\cos 2t} = \frac{1}{2 \cos 2t}.$

2. Compute  $\int x e^{-x} dx$

$$\int \underline{x} \underline{e^{-x}} dx = x \cdot (-e^{-x}) - \int 1 \cdot (-e^{-x}) dx$$

DIFF      INT

$$= -x e^{-x} + \int e^{-x} dx$$

$$= -x e^{-x} - e^{-x} + C.$$