Sep 3 warmups

Use u-sub for $\int_0^{\pi/2} 2\sin(x)\cos(x)\,dx$

$\int 2\sin(x)\cos(x)\,dx = 2\int \sin(x)\cos(x)\,dx$

$u = \sin(x)$ $\quad \frac{du}{dx} = \cos(x)\cdot dx \rightarrow \frac{du}{\cos x} = \frac{\cos x\,dx}{\cos x}$

$dx = \frac{1}{\cos x}\,du$

$2\int u\cos(x)\,dx \rightarrow 2\int u\cos x\cdot\frac{1}{\cos x}\cdot du \rightarrow 2\int u\cdot\frac{\cos x}{\cos x}\cdot du$

$2\int u\cdot 1\cdot du \rightarrow 2\cdot\frac{1}{2}u^2 + C\Big|_0^{\pi/2} \rightarrow u^2 + C\Big|_0^{\pi/2}$

$\sin(x)^2 + C\Big|_0^{\pi/2} \rightarrow \sin\left(\frac{\pi}{2}\right)^2 + C - \left(\sin(0)^2 + C\right) = 1^2 + C - (0 + C) = 1$

Find $\int \sec^2(x)\tan^6(x)\sec^2(x)\,dx$

u^6 $\quad du = \sec^2(x)\,dx$

$u = \tan(x) \rightarrow \frac{du}{dx} = \sec^2(x) \rightarrow du = \sec^2(x)\,dx$

$\int \sec^2(x)\,u^6\,du \rightarrow \int (1+u^2)u^6\,du = \int (u^6 + u^8)\,du$

$1 + u^2$

$\int (u^6 + u^8)\,du = \frac{1}{7}u^7 + \frac{1}{9}u^9 + C = \frac{\tan^7(x)}{7} + \frac{\tan^9(x)}{9} + C$

$= \frac{\tan^7(x)}{7} + \frac{\tan^9(x)}{9} + C$