Name: Richard

QUIZ 10

MATH 201
February 27, 2025

1. $\int \tan^3(x)\,dx = \int \tan(x)\tan^2(x)\,dx$

$= \int \tan(x)\left(\sec^2(x)-1\right)dx$

$= \int \left(\tan(x)\sec^2(x) - \tan(x)\right)dx$

$= \int \tan(x)\sec^2(x)\,dx - \int \tan(x)\,dx$

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

$= \int u\,du - \ln|\sec(x)| + C$

$= \frac{u^2}{2} - \ln|\sec(x)| + C$

$= \boxed{\frac{\tan^2(x)}{2} - \ln|\sec(x)| + C}$

Check: $\frac{d}{dx}\left[\frac{\tan^2(x)}{2} - \ln|\sec(x)| + C\right]$

$= \tan(x)\sec^2(x) - \frac{\sec(x)\tan(x)}{\sec(x)} + 0$

$= \tan(x)\left(1+\tan^2(x)\right) - \tan(x)$ ✓

$= \tan(x) + \tan^3(x) - \tan(x) = \underline{\underline{\tan^3(x)}}$ YES

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1. $\int \sec^4(x)\,dx = \int \sec^2(x)\sec^2(x)\,dx$

$$= \int (\tan^2(x)+1)\sec^2(x)\,dx$$

$$= \int \left(\tan^2(x)\sec^2(x) + \sec^2(x)\right) dx$$

$$= \int \tan^2(x)\sec^2(x)\,dx + \int \sec^2(x)\,dx$$

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

$$= \int u^2\,du + \tan(x) + C$$

$$= \frac{u^3}{3} + \tan(x) + C$$

$$= \boxed{\frac{\tan^3(x)}{3} + \tan(x) + C}$$

Check: $\frac{d}{dx}\left[\frac{\tan^3(x)}{3} + \tan(x) + C\right]$

$$= \tan^2(x)\sec^2(x) + \sec^2(x) + 0$$

$$= (\sec^2(x)-1)\sec^2(x) + \sec^2(x)$$

$$= \sec^4(x) - \sec^2(x) + \sec^2(x) = \sec^4(x)$$

YES