**Topic**: Trigonometric integrals

**Question**: Evaluate the trigonometric integral.

$$\int \sec^2 x + x^2 \, dx$$

**Answer choices**:

A $\frac{1}{3}\sec^3 x + \frac{1}{3}x^3 + C$

B $\tan x + \frac{1}{3}x^3 + C$

C $\sec x \tan x + \frac{1}{3}x^3 + C$

D $2\sec^2 x \tan x + 2x + C$

**Solution**: B

In order to integrate the sum of two terms, we integrate each term and add the results.

$$\int \sec^2 x + x^2 \, dx$$

$$\int \sec^2 x \, dx + \int x^2 \, dx$$

$$\tan x + \frac{1}{3}x^3 + C$$

**Topic**: Trigonometric integrals

**Question**: Evaluate the trigonometric integral.

$$\int_{-\frac{\pi}{4}}^{\frac{\pi}{4}} 1 - \cos x \ dx$$

**Answer choices**:

A $\frac{\pi}{2} + \sqrt{2}$

B $\frac{\pi}{2} - \sqrt{2}$

C $\sqrt{2}$

D $-\sqrt{2}$

**Solution**: B

Since

$$\frac{d}{dx}(x) = 1$$

and

$$\frac{d}{dx}(\sin x) = \cos x$$

we have

$$\int_{-\frac{\pi}{4}}^{\frac{\pi}{4}} 1 - \cos x \; dx$$

$$\int_{-\frac{\pi}{4}}^{\frac{\pi}{4}} 1 \; dx - \int_{-\frac{\pi}{4}}^{\frac{\pi}{4}} \cos x \; dx$$

$$x\Big|_{-\frac{\pi}{4}}^{\frac{\pi}{4}} - \sin x\Big|_{-\frac{\pi}{4}}^{\frac{\pi}{4}}$$

$$x - \sin x\Big|_{-\frac{\pi}{4}}^{\frac{\pi}{4}}$$

$$\frac{\pi}{4} - \sin\left(\frac{\pi}{4}\right) - \left[-\frac{\pi}{4} - \sin\left(-\frac{\pi}{4}\right)\right]$$

$$\frac{\pi}{4} - \frac{\sqrt{2}}{2} - \left[ -\frac{\pi}{4} - \left( -\frac{\sqrt{2}}{2} \right) \right]$$

$$\frac{\pi}{2} - \sqrt{2}$$

**Topic**: Trigonometric integrals

**Question**: Evaluate the trigonometric integral.

$$\int \frac{\sin^3 x}{1-\cos^2 x}\, dx$$

**Answer choices**:

A $\dfrac{-\cos x}{x-\frac{1}{3}\cos^3 x}+C$

B $\dfrac{1}{2\sin x}+C$

C $-\cos x+C$

D $\cos x+C$

**Solution**: C

Before we can integrate, we have to rewrite the integral to simplify it.

$$\int \frac{\sin^3 x}{1-\cos^2 x}\, dx$$

$$\int \frac{\sin^3 x}{\sin^2 x}\, dx$$

$$\int \sin x \; dx$$

$$-\cos x + C$$