

## 242 QUIZ 1 SOLUTIONS

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**Problem 1.1.** *By the Fundamental Theorem of Calculus (version 1),*

$$\frac{d}{dx} \left( \int_1^x \frac{1}{t} dt \right) = \frac{1}{x}$$

**Problem 1.2.**

$$\frac{d}{dx} \left( \tan(x^2 + 1) \right) = 2x \sec^2(x^2 + 1) \quad (\text{By the chain rule.})$$

**Problem 1.3.**

$$\int \cos^3(x) dx = \int (1 - \sin^2(x)) \cos(x) dx \quad (\text{since } \cos^2(x) = 1 - \sin^2(x))$$

$$\begin{aligned} & \text{Let } u = \sin(x) \quad \text{so that} \quad du = \cos(x) dx \\ & = \int 1 - u^2 du = u - \frac{u^3}{3} + C = \sin(x) - \frac{\sin^3(x)}{3} + C \end{aligned}$$

**Problem 1.4.**

$$\begin{aligned} & \int x \sec^2(x^2) dx \quad \text{Set } u = x^2 \quad \text{so that} \quad du = 2x dx \\ & = \frac{1}{2} \int \sec^2(u) du = \frac{1}{2} \tan(u) + C = \frac{1}{2} \tan(x^2) + C \end{aligned}$$

**Problem 1.5.**

$$\frac{d}{dx} \left( \frac{1}{\sqrt[3]{x^2 + 7}} \right) = -\frac{1}{3}(x^2 + 7)^{-4/3}(2x)$$

**Problem 1.6.**

$$\frac{d}{dx} \left( x^2 \sin(2x) \right) = 2x \sin(2x) + x^2 \cos(2x) 2$$