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Complete the following problems. Show all work to receive full credit.

1. Calculate the following:

$$\begin{aligned} \text{(a)} \quad \frac{d}{dx} \left( \int_1^{\sin x} 3t^2 dt \right) \\ = 3 \sin^2 x \cdot \cos x \end{aligned}$$

$$\begin{aligned} \text{(b)} \quad \int_{-1}^1 (r+1)^2 dr \\ = \frac{1}{3} (r+1)^3 \Big|_{-1}^1 \\ = \frac{1}{3} (1+1)^3 - \frac{1}{3} (-1+1)^3 \\ = \frac{1}{3} \cdot 8 - \frac{1}{3} \cdot 0 \\ = \frac{8}{3} \end{aligned}$$

$$\begin{aligned} \text{(c)} \quad \int_0^{\frac{\pi}{4}} \tan x \sec^2 x dx \\ = \frac{1}{2} \tan^2 x \Big|_0^{\frac{\pi}{2}} \\ = \frac{1}{2} \tan^2 \left( \frac{\pi}{2} \right) - \frac{1}{2} \tan^2 0 \\ = \frac{1}{2} - 0 = \frac{1}{2} \end{aligned}$$

$$\begin{aligned} \text{(d)} \quad \int_0^{\frac{\pi}{2}} e^{\sin x} \cos x dx \\ = e^{\sin x} \Big|_0^{\frac{\pi}{2}} \\ = e^{\sin \frac{\pi}{2}} - e^{\sin 0} \\ = e^{\frac{\sqrt{2}}{2}} - 1 \end{aligned}$$