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

1.  $\int_0^{\frac{\pi}{3}} 2 \sec^2 x \, dx$

$$\begin{aligned} &= 2 \tan x \Big|_0^{\frac{\pi}{3}} \\ &= 2 \tan \frac{\pi}{3} - 2 \tan 0 \\ &= 2 \cdot \sqrt{3} - 0 \\ &= 2\sqrt{3} \end{aligned}$$

2.  $\int_{\frac{\pi}{2}}^0 \frac{1 + \cos 2t}{2} \, dt$

$$\begin{aligned} &= \int_{\frac{\pi}{2}}^0 \frac{1}{2} + \frac{1}{2} \cos 2t \, dt \\ &= \frac{1}{2}t + \frac{1}{4} \sin 2t \Big|_{\frac{\pi}{2}}^0 \\ &= \frac{1}{2} \cdot 0 + \frac{1}{4} \sin 0 - \frac{1}{2} \frac{\pi}{2} - \frac{1}{4} \sin \pi \\ &= +0 + 0 - \frac{\pi}{4} - 0 \\ &= -\frac{\pi}{4} \end{aligned}$$

3.  $\frac{d}{dx} \int_0^{x^4} \sqrt{t} \, dt$

$$\begin{aligned} &= \sqrt{x^4} \cdot 4x^3 \\ &= x^2 \cdot 4x^3 \\ &= 4x^5 \end{aligned}$$