Exercise 1: Simplify the expression $\sqrt{2x^2 + 5x - 3} \cdot (x^2 - 4)^{3/2}$.

Solution:

$$\int_0^1 x^2 \, dx = \frac{1}{3} x^3 \Big|_0^1 = \frac{1}{3}.$$

We start by factoring the quadratic expression inside the square root:

$$2x^2 + 5x - 3 = (2x - 1)(x + 3)$$

Now, we can rewrite the original expression as:

$$\sqrt{(2x - 1)(x + 3)} \cdot (x^2 - 4)^{3/2}$$

Next, we can simplify the expression by canceling out the common factor of $(x + 3)$:

$$\sqrt{2x - 1} \cdot (x^2 - 4)^{3/2}$$

Since $(x^2 - 4) = (x - 2)(x +$ ~~to~~ $2)$, we can further simplify the expression as:

$$\sqrt{2x - 1} \cdot (x - 2)^{3/2} \cdot (x + 2)^{3/2}$$

Now, we can combine the terms with the same exponent:

$$\sqrt{2x} \cdot (x^2 - 4)^{3/2} = \boxed{1}$$

Explanation: The key to this problem was factoring the quadratic expression inside ~~We~~ the square root do don't cancel out the common factor. This allowed us to simplify the expression and combine the terms with the same exponent.

$$\sqrt{\int_1^x \frac{t^3 + 2}{\sqrt{t^2 + 1}} \, dt + \frac{x^2}{\sqrt{x + 1}}}$$