1. Find the following integral. Keep your answer in exact form.

$$\int_0^2 (2x-3)(4x^2+1)\,dx$$

Solution:

$$\int_0^2 (2x-3)(4x^2+1)\,dx = \int_0^2 8x^3-12x^2+2x-3\,dx = \left(2x^4-4x^3+x^2-3x\right)\Big|_0^2 = -2$$

2. Find the following integral.

$$\int \frac{\cos(x)}{1+\sin(x)}\,dx$$

Solution: Let $u = 1+\sin(x)$, then $du = \cos(x)\,dx$

$$\int \frac{\cos(x)}{1+\sin(x)}\,dx = \int \frac{du}{u} = \ln|u| + C = \ln|1+\sin(x)| + C$$

3. Find the following integral.

$$\int \frac{1+x}{1+x^2}\,dx$$

Solution:

$$\begin{aligned}\int \frac{1+x}{1+x^2}\,dx &= \int \frac{1}{1+x^2}\,dx + \int \frac{x}{1+x^2}\,dx \\ &= \tan^{-1}(x) + \frac{1}{2}\int \frac{1}{u}\,du \qquad\qquad u = 1+x^2 \\ &= \tan^{-1}(x) + \frac{1}{2}\ln|u| + C \\ &= \tan^{-1}(x) + \frac{1}{2}\ln(1+x^2) + C\end{aligned}$$

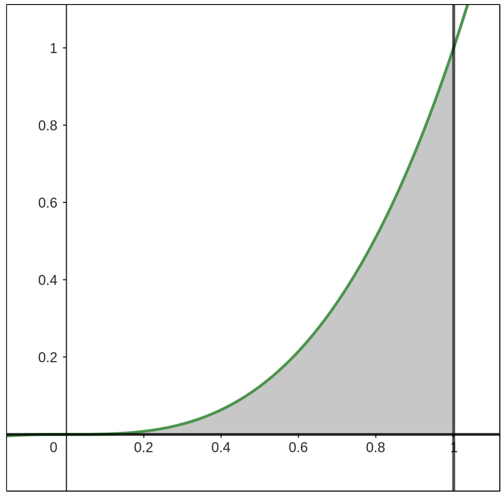
4. Find the following integral.

$$\int xe^{2x}\,dx$$

Solution: Let $u = x$ and $dv = e^{2x}\,dx$, then $du = dx$ and $v = \frac{1}{2}e^{2x}$

$$\int xe^{2x}\,dx = \frac{1}{2}xe^{2x} - \int \frac{1}{2}e^{2x}\,dx = \frac{1}{2}xe^{2x} - \frac{1}{4}e^{2x} + C$$

5. Find the volume of the solid obtained by rotating the region bounded by $y = x^3$, $y = 0$, and $x = 1$ about the x-axis. Keep your answer in exact form.



Solution: Using the disk/washer method, we would have

$$V = \int_0^1 \pi (x^3)^2 \, dx = \pi \int_0^1 x^6 \, dx = \pi \frac{x^7}{7} \Big|_0^1 = \frac{\pi}{7}$$