1. Use integration to find (a) the area under \( f(x) = x^4 \) from \( x = 1 \) to \( x = 3 \); (b) the area under \( f(x) = \sin x \) from \( x = 0 \) to \( x = \pi/2 \).

(a) \[ \int_1^3 x^4 \, dx = \left. \frac{x^5}{5} \right|_1^3 = \frac{3^5}{5} - \frac{1^5}{5} = \frac{242}{5} \]

(b) \[ \int_0^{\pi/2} \sin x \, dx = \left. -\cos x \right|_0^{\pi/2} = -\cos \frac{\pi}{2} - (-\cos 0) = 1 \]

2. Note that \( \frac{d}{dx}(-x \cos x + \sin x) = x \sin x \). Evaluate \( \int_0^\pi x \sin x \, dx \).

\[ \int_0^\pi x \sin x \, dx = \left. -x \cos x + \sin x \right|_0^{\pi} \]

\[ = -\pi \cos \pi - \sin \pi - (0 + 0) \]

\[ = \pi \]

3. Evaluate:

(a) \[ \int_0^2 (3x^2 + 5x) \, dx = \left. x^3 + \frac{5}{2} \cdot x^2 \right|_0^2 \]

\[ = 8 + \frac{5}{2} \cdot 4 = 18 \]

(b) \[ \int_0^{\ln 3} 4e^{2x} \, dx = \left. 2e^{2x} \right|_0^{\ln 3} \]

\[ = 2e^{2\ln 3} - 2e^0 \]

\[ = 2e^{\ln 3^2} - 2 \]

\[ = 2 \cdot 3^2 - 2 = 16 \]