Solutions

1. Use part one of the Fundamental Theorem of Calculus to find the derivative of the function.

\[ y = \int_2^{x^2} \frac{\cos t}{t^4} \, dt \]

\[ \frac{dy}{dx} = \frac{\cos(x^2)}{x^8} \cdot \frac{d}{dx}[x^2] = \frac{2 \cos(x^2)}{x^7} \]

2. Make a substitution and then use integration by parts to evaluate the integral.

\[ \int 10x^9 \sin(x^5) \, dx \]

Let \( u = x^5 \) \( \Rightarrow du = 5x^4 \, dx \)

\[ \frac{du}{5} = x^4 \, dx \]

Substituting, the above integral becomes:

\[ 2 \int u \sin u \, du \]

\[ dv = \sin u \, du \quad w = u \]

\[ v = -\cos u \quad dw = du \]

Integration by parts yields:

\[ 2 \left[ -u \cos u - \int (-\cos u) \, du \right] \]

\[ = -2u \cos u + 2 \sin u + C \]

\[ = -2x^5 \cos(x^5) + 2 \sin(x^5) + C \]