Integration Strategy
Evaluate each of the following integrals. You may use any method from Calculus I or Calculus II to do these integrals.

1. \[ \int \cos^4(4t) \sin^3(8t) \, dt \]
   Hint: You’ll need to make sure that the trig function arguments are the same...

2. \[ \int (2z + e^{4z})^2 \, dz \]

3. \[ \int \frac{\left[ \ln(2x) \right]^2}{x \left( \left[ \ln(2x) \right]^2 + 2 \ln(2x) - 15 \right)} \, dx \]

4. \[ \int y^7 \sqrt{25 + 4y^4} \, dy \]

5. \[ \int t^5 e^{-t^3} \, dt \]

Improper Integrals
Determine if each of the following integrals are convergent or divergent. Evaluate the integral if it is convergent.

6. \[ \int_{-\infty}^{\infty} xe^{x^2+1} \, dx \]

7. \[ \int_0^3 \frac{x+1}{x^2 - 4} \, dx \]

8. \[ \int_0^{\infty} x^2 \ln(2x) \, dx \]

Comparison Test for Improper Integrals
Use the Comparison Test to determine if the integral converges or diverges. Do not find the value of the integral if it converges.

9. \[ \int_1^{\infty} \frac{xe^{-x} - \sin^2(x)}{x^4} \, dx \]

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10. \[ \int_{2}^{\infty} \frac{x + 1}{x^2 - \ln(x)} \, dx \] 

Hint: Try graphing \( f(x) = x \) and \( f(x) = \ln(x) \) on the same graph to get a nice relationship between the two functions. Then think about how \( x \) and \( x^2 \) are related on the interval we’re working on.

**Approximating Definite Integrals**

11. Use the MidPoint Rule, Trapezoid Rule, and Simpson’s Rule with \( n = 4 \) to approximate the value of,

\[ \int_{4}^{6} \frac{\cos x}{x} \, dx \]