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

1. $\int \cos^3(1-2\theta)\sin^6(1-2\theta)\,d\theta$

2. $\int (t+2\cos(3t))^2\,dt$

3. $\int \frac{(1+\sin x)\cos x}{\sin^2 x-14\sin x+24}\,dx$

4. $\int e^{2z}\sqrt{1-e^{4z}}\,dz$

5. $\int t^7e^{t+2}\,dt$

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

6. $\int_{-\infty}^{6} 10xe^{x^2}\,dx$

7. $\int_{1}^{4} \frac{1}{y^2-3y}\,dy$

8. $\int_{0}^{\infty} \frac{1}{z^2}e^{-\frac{1}{z^2}}\,dz$

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. $\int_{1}^{\infty} \frac{e^{-x}}{x+2}\,dx$

10. $\int_{5}^{\infty} \frac{x^2+\cos^2 x}{x^3\sin^4 x}\,dx$

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Approximating Definite Integrals

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

\[
\int_{1}^{3} \ln(x^4 + 2) \, dx
\]