§5.10: Improper Integrals

Decide whether or not the following improper integrals converge or diverge.

Type I: Integrals over infinite intervals

1. $\displaystyle\int_1^\infty \frac{1}{x}\,dx$

2. $\displaystyle\int_3^\infty \frac{1}{9+x^2}\,dx$

3. $\displaystyle\int_1^\infty \frac{1}{x^p}\,dx$, where $p \neq 1$

Type II: Integrals of functions with vertical asymptotes

4. $\displaystyle\int_1^2 \frac{1}{\sqrt{x-1}}\,dx$

5. $\displaystyle\int_0^1 \ln(x)\,dx$

6. $\displaystyle\int_1^4 \frac{1}{x-2}\,dx$

Miscellaneous

7. $\displaystyle\int_{-\infty}^{\infty} te^{-t^2}\,dt$

8. $\displaystyle\int_{1}^{\infty} \frac{1}{x\ln(x)}\,dx$

9. $\displaystyle\int_{-\infty}^{10} \sin^2 x\,dx$

Comparison Test

10. $\displaystyle\int_3^\infty \frac{\ln(x)}{\sqrt{x}}\,dx$

11. $\displaystyle\int_1^\infty \frac{|\sin x|}{x^2+1}\,dx$