

## §5.10: Improper Integrals

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

**Type I:** Integrals over infinite intervals

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

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

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

**Type II:** Integrals of functions with vertical asymptotes

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

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

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

**Miscellaneous**

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

8. 
$$\int_1^{\infty} \frac{1}{x \ln(x)} dx$$

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

**Comparison Test**

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

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