

1. Determine whether the improper integral converges or diverges.

$$(a) \int_1^{\infty} \frac{1}{x^3 + 2} dx \quad (b) \int_8^{\infty} \frac{1}{\sqrt{x} - 2} dx$$

2. Consider the improper integral $\mathcal{I} = \int_0^5 \frac{1}{\sqrt{x} + x^2} dx$

(a) Compare \mathcal{I} to $\int_0^5 \frac{1}{\sqrt{x}} dx$. What can you conclude about \mathcal{I} from this comparison?

(b) Compare \mathcal{I} to $\int_0^5 \frac{1}{x^2} dx$. What can you conclude about \mathcal{I} from this comparison?

3. Consider the improper integral $\mathcal{I} = \int_5^{\infty} \frac{1}{\sqrt{x} + x^2} dx$

(a) Compare \mathcal{I} to $\int_5^{\infty} \frac{1}{\sqrt{x}} dx$. What can you conclude about \mathcal{I} from this comparison?

(b) Compare \mathcal{I} to $\int_5^{\infty} \frac{1}{x^2} dx$. What can you conclude about \mathcal{I} from this comparison?