Definite Integrals

Evaluate the following definite integrals

1. \( I(t) = \int_{-\infty}^{\infty} \frac{e^{itx}}{(x + i)^2} \, dx \) with \( t \in \mathbb{R} \).

2. \( \int_{0}^{\infty} \frac{(\log x)^2}{1 + x^2} \, dx \)

3. \( \int_{0}^{\infty} \frac{\sin x}{x} \, dx \)

4. \( \int_{0}^{\infty} \frac{\log x}{1 + x^2} \, dx \)

5. \( \int_{0}^{\pi} \frac{1}{1 + 2\alpha \cos \theta + \alpha^2} \, d\theta \) where \( \alpha \) is real and \( \alpha \neq -1, 1 \).

6. \( \int_{-\infty}^{\infty} \frac{x \sin x}{x^2 + 4} \, dx \)

7. \( \int_{0}^{2\pi} \frac{\cos x}{2 + \cos x} \, dx \)

8. \( \int_{0}^{\infty} \frac{\cos x - 1}{x^2(1 + x^2)} \, dx \)

9. \( \int_{0}^{\infty} \frac{\log x}{(1 + x^2)^2} \, dx \)

10. \( \int_{0}^{\infty} \frac{x^{1/6}}{(x + 5)^2} \, dx \)

11. \( \int_{-\infty}^{\infty} \frac{e^{ix}}{(\pi - x)^2 + 4} \, dx \)

12. \( \int_{0}^{\infty} \frac{x^{1/2}}{1 + x^2} \, dx \)
13. $\int_0^\pi \frac{1}{2 + \cos \theta} \, d\theta$

14. $\int_0^\infty \frac{\cos x}{(1 + x^2)^2} \, dx$

15. $\int_0^\infty \frac{\cos x}{1 + x^2} \, dx$

16. $\int_0^\infty \frac{x}{1 + x^3} \, dx$

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

18. $\int_0^1 \log(x) \log(1 - x) \, dx$

19. $\int_{-\infty}^\infty \frac{\sin x}{x} e^{ixy} \, dx$, with $y \in \mathbb{R}$