

Evaluate  $\int_{-\infty}^{\infty} \frac{\cos 2x}{1+x^2} dx$ . [95 中央機械能源 10(b)]

[解]令  $f(z) = \frac{e^{i2z}}{1+z^2}$ ,  $f(z)$  在上半平面有單極點  $z = i$

$$\text{Res}[f(z); i] = \left. \frac{e^{i2z}}{2z} \right|_{z=i} = \frac{e^{-2}}{2i}$$

$$\int_{-\infty}^{\infty} \frac{\cos 2x dx}{1+x^2} = \text{Re}(2\pi i \cdot \frac{e^{-2}}{2i}) = \pi e^{-2}$$

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