



PROBLEM:

For each of the following problems, **SIMPLIFY** your answer as much as possible.

(a) Evaluate $\Im\{x[n]x^*[n-1]\}$ when $x[n] = e^{j(0.1)\pi n}$.

(b) Evaluate the following expression, $|e^{j\pi/6} - e^{-j\pi/6}| =$

(c) Evaluate the following integral, $\int_{-\infty}^t \delta(\tau - 7) \sin(\tau) e^{-j\pi\tau/2} d\tau$

(d) Evaluate the following integral, $\int_{-\infty}^{\infty} e^{-5t} u(t) e^{-j\omega t} dt$.



For each of the following problems, **SIMPLIFY** your answer as much as possible.

(a) Evaluate $\Im\{x[n]x^*[n-1]\}$ when $x[n] = e^{j(0.1)\pi n}$.

$$\begin{aligned}
 &= \Im\{e^{j(0.1)\pi n} \cdot e^{-j(0.1)\pi(n-1)}\} \\
 &= \Im\{e^{j(0.1)\pi}\} = \sin(0.1\pi)
 \end{aligned}$$

(b) Evaluate the following expression, $|e^{j\pi/6} - e^{-j\pi/6}| =$

1

$$= 2j \sin \frac{\pi}{6} = j$$

$$|j| = 1$$

(c) Evaluate the following integral, $\int_{-\infty}^t \delta(\tau - 7) \sin(\tau) e^{-j\pi\tau/2} d\tau$

$$\sin(7) e^{-j\pi 7/2} = j \sin(7)$$

$$= j \sin(7) \int_{-\infty}^t \delta(\tau - 7) d\tau$$

$$= j \sin(7) u(t - 7)$$

(d) Evaluate the following integral, $\int_{-\infty}^{\infty} e^{-5t} u(t) e^{-j\omega t} dt$.

THIS IS THE FOURIER TRANSFORM OF $e^{-5t} u(t)$.

\therefore

$$\text{ANS} = \frac{1}{5 + j\omega}$$