

Prob. 4.1 (b)

$$x_b(t) = e^{-2|t-1|}$$

Recall Example 4.2 in Text: also in my version Table 4.2

2-sided exponential $a > 0$

$$e^{-a|t|} \longleftrightarrow \frac{2a}{a^2 + \omega^2} \quad a > 0$$

Plus: time-shift property of Fourier Transform

$$X_b(\omega) = \underbrace{\frac{2(2)}{4 + \omega^2}}_{\substack{\text{real-valued} \\ + \text{strictly positive}}} \underbrace{e^{-j\omega}}_{\text{only affects phase}}$$

Thus: $|X_b(\omega)| = \frac{4}{4 + \omega^2}$

see plot in Example 4.2

Prob. 4.1 Help

$$(a) \quad x_a(t) = e^{-2(t-1)} u(t-1)$$

Recall) Example 4.1 in Text: ^{also in} Table 4.2

$$e^{-at} u(t) \xleftrightarrow{+} \frac{1}{a+j\omega} \quad a > 0$$

Also, time-shift property of Fourier Transform

$$x(t-t_0) \xleftrightarrow{+} X(\omega) e^{-j\omega t_0}$$

Thus:

$$X_a(\omega) = \frac{1}{2+j\omega} \underbrace{e^{-j\omega(1)}}_{\substack{\bullet \text{ does not affect magnitude} \\ \bullet \text{ only impacts phase}}}$$

$$|X_a(\omega)| = \frac{1}{\sqrt{(-2)^2 + \omega^2}} = \frac{1}{\sqrt{4 + \omega^2}}$$