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so many fake sites. this is the first one which worked! Many thanks

## Chapter 2

2.1-1 Let us denote the signal in question by  $x(t)$  and its energy by  $E_x$ . For parts (a) and (b)

$$E_x = \int_{-\infty}^{\infty} \cos^2 t \, dt = \frac{1}{2} \int_{-\infty}^{\infty} (1 + \cos 2t) \, dt = \frac{1}{2} \int_{-\infty}^{\infty} 1 \, dt + \frac{1}{2} \int_{-\infty}^{\infty} \cos 2t \, dt = \infty + 0 = \infty$$

(a)  $E_x = \int_{-\infty}^{\infty} \cos^2 t \, dt = \frac{1}{2} \int_{-\infty}^{\infty} (1 + \cos 2t) \, dt = \frac{1}{2} \int_{-\infty}^{\infty} 1 \, dt + \frac{1}{2} \int_{-\infty}^{\infty} \cos 2t \, dt = \infty + 0 = \infty$

(b)  $E_x = \int_{-\infty}^{\infty} (2 \cos^2 t - 1) \, dt = \int_{-\infty}^{\infty} (\cos 2t) \, dt = 0$

2.1-2 (a)  $E_x = \int_{-\infty}^{\infty} (1/t^2)^2 \, dt = \int_{-\infty}^{\infty} 1/t^4 \, dt = \int_{-\infty}^{-1} 1/t^4 \, dt + \int_{1}^{\infty} 1/t^4 \, dt = \left[ -\frac{1}{3t^3} \right]_{-\infty}^{-1} + \left[ -\frac{1}{3t^3} \right]_{1}^{\infty} = \frac{1}{3} + \frac{1}{3} = \frac{2}{3}$

Therefore  $E_{2x} = E_x = \frac{2}{3}$ .

(b) If  $x = \int_{-\infty}^{\infty} (1/t^2)^2 \, dt = \int_{-\infty}^{\infty} 1/t^4 \, dt = \frac{2}{3}$ , then  $E_x = \int_{-\infty}^{\infty} (1/t^2)^2 \, dt = \frac{2}{3}$ .

2.1-3  $E_x = \int_{-\infty}^{\infty} \cos^2 t \, dt = \frac{1}{2} \int_{-\infty}^{\infty} (1 + \cos 2t) \, dt = \frac{1}{2} \int_{-\infty}^{\infty} 1 \, dt + \frac{1}{2} \int_{-\infty}^{\infty} \cos 2t \, dt = \infty + 0 = \infty$

2.1-4 This problem is identical to Example 2.20, except that  $\omega_1 \neq \omega_2$ . In this case the third integral in  $I_3$  (see p. 15) is not zero. That integral is given by

$$I_3 = \int_{-\infty}^{\infty} \cos(\omega_1 t) \cos(\omega_2 t) \, dt = \frac{1}{2} \int_{-\infty}^{\infty} (\cos((\omega_1 + \omega_2)t) + \cos((\omega_1 - \omega_2)t)) \, dt = \frac{1}{2} \left[ \int_{-\infty}^{\infty} \cos((\omega_1 + \omega_2)t) \, dt + \int_{-\infty}^{\infty} \cos((\omega_1 - \omega_2)t) \, dt \right]$$
$$= \frac{1}{2} \left[ \int_{-\infty}^{\infty} \cos(\omega_3 t) \, dt + \int_{-\infty}^{\infty} \cos(\omega_4 t) \, dt \right] = \frac{1}{2} \left[ 0 + 0 \right] = 0$$

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