

Solution of ECE 315 Test 9 F08

Find the numerical values of the constants.

$$1. \quad 4 \operatorname{rect}(2t) * \delta_8 \xrightarrow{F} A \operatorname{sinc}(bf) \delta_c(f)$$

$$4 \operatorname{rect}(2t) * \delta_8 \xrightarrow{F} 2 \operatorname{sinc}(f/2) \times (1/8) \delta_{1/8}(f) = (1/4) \operatorname{sinc}(f/2) \delta_{1/8}(f)$$

$$2. \quad A \cos(b(t+c)) \xrightarrow{F} 6[\delta(f-3) + \delta(f+3)] e^{-j4\pi f}$$

$$\cos(6\pi t) \xrightarrow{F} \frac{1}{2} [\delta(f-3) + \delta(f+3)]$$

$$12 \cos(6\pi t) \xrightarrow{F} 6 [\delta(f-3) + \delta(f+3)]$$

$$12 \cos(6\pi(t-2)) \xrightarrow{F} 6 [\delta(f-3) + \delta(f+3)] e^{-j4\pi f}$$

$$3. \quad 10 \sin(20\pi t) \cos(100\pi t) \xrightarrow{F} A [\delta(f-b) + \delta(f+c) - \delta(f-c) - \delta(f+b)]$$

$$10 \sin(20\pi t) \cos(100\pi t) \xrightarrow{F} 10 \times (j/2) [\delta(f+10) - \delta(f-10)] * (1/2) [\delta(f-50) + \delta(f+50)]$$

$$10 \sin(20\pi t) \cos(100\pi t) \xrightarrow{F} (j5/2) [\delta(f-40) + \delta(f+60) - \delta(f-60) - \delta(f+40)]$$

$$4. \quad \frac{d}{dt} (A \operatorname{tri}(t/b)) \xrightarrow{F} j30\pi f \operatorname{sinc}^2(3f)$$

$$\frac{d}{dt} (5 \operatorname{tri}(t/3)) \xrightarrow{F} j2\pi f \times 15 \operatorname{sinc}^2(3f)$$

$$\frac{d}{dt} (5 \operatorname{tri}(t/3)) \xrightarrow{F} j30\pi f \operatorname{sinc}^2(3f)$$

$$5. \quad A \operatorname{sinc}(bt) \xrightarrow{F} 12 \operatorname{rect}(4\omega)$$

$$\operatorname{sinc}(t) \xrightarrow{F} \operatorname{rect}(f)$$

$$\operatorname{sinc}(t) \xrightarrow{F} \operatorname{rect}(\omega/2\pi)$$

$$(1/8\pi) \operatorname{sinc}(t/8\pi) \xrightarrow{F} \operatorname{rect}(4\omega)$$

$$(3/2\pi) \operatorname{sinc}(t/8\pi) \xrightarrow{F} 12 \operatorname{rect}(4\omega)$$

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Find the numerical values of the constants .

1. $2 \operatorname{rect}(3t) * \delta_7 \xrightarrow{F} A \operatorname{sinc}(bf) \delta_c(f)$

$$2 \operatorname{rect}(3t) * \delta_7 \xrightarrow{F} (2/3) \operatorname{sinc}(f/3) \times (1/7) \delta_{1/7}(f) = (2/21) \operatorname{sinc}(f/3) \delta_{1/7}(f)$$

2. $A \cos(b(t+c)) \xrightarrow{F} 8[\delta(f-5) + \delta(f+5)] e^{-j6\pi f}$

$$\begin{aligned} \cos(10\pi t) &\xrightarrow{F} \frac{1}{2} [\delta(f-5) + \delta(f+5)] \\ 16 \cos(6\pi t) &\xrightarrow{F} 8 [\delta(f-5) + \delta(f+5)] \\ 16 \cos(6\pi(t-3)) &\xrightarrow{F} 8 [\delta(f-5) + \delta(f+5)] e^{-j6\pi f} \end{aligned}$$

3. $18 \sin(50\pi t) \cos(200\pi t) \xrightarrow{F} A [\delta(f-b) + \delta(f+c) - \delta(f-c) - \delta(f+b)]$

$$18 \sin(50\pi t) \cos(200\pi t) \xrightarrow{F} 18 \times (j/2) [\delta(f+25) - \delta(f-25)] * (1/2) [\delta(f-100) + \delta(f+100)]$$

$$10 \sin(20\pi t) \cos(100\pi t) \xrightarrow{F} (j9/2) [\delta(f-75) + \delta(f+125) - \delta(f-125) - \delta(f+75)]$$

4. $\frac{d}{dt} (A \operatorname{tri}(t/b)) \xrightarrow{F} j80\pi f \operatorname{sinc}^2(5f)$

$$\begin{aligned} \frac{d}{dt} (8 \operatorname{tri}(t/5)) &\xrightarrow{F} j2\pi f \times 40 \operatorname{sinc}^2(5f) \\ \frac{d}{dt} (8 \operatorname{tri}(t/5)) &\xrightarrow{F} j80\pi f \operatorname{sinc}^2(5f) \end{aligned}$$

5. $A \operatorname{sinc}(bt) \xrightarrow{F} 9 \operatorname{rect}(12\omega)$

$$\begin{aligned} \operatorname{sinc}(t) &\xrightarrow{F} \operatorname{rect}(f) \\ \operatorname{sinc}(t) &\xrightarrow{F} \operatorname{rect}(\omega/2\pi) \\ (1/24\pi) \operatorname{sinc}(t/24\pi) &\xrightarrow{F} \operatorname{rect}(12\omega) \\ (3/8\pi) \operatorname{sinc}(t/24\pi) &\xrightarrow{F} 9 \operatorname{rect}(12\omega) \end{aligned}$$

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Find the numerical values of the constants .

1. $3\text{rect}(8t) * \delta_2 \xrightarrow{F} A \text{sinc}(bf) \delta_c(f)$

$$3\text{rect}(8t) * \delta_2 \xrightarrow{F} (3/8) \text{sinc}(f/8) \times (1/2) \delta_{1/2}(f) = (3/16) \text{sinc}(f/8) \delta_{1/2}(f)$$

2. $A \cos(b(t+c)) \xrightarrow{F} 14 [\delta(f-9) + \delta(f+9)] e^{-j\pi f}$

$$\cos(18\pi t) \xrightarrow{F} \frac{1}{2} [\delta(f-9) + \delta(f+9)]$$

$$28 \cos(18\pi t) \xrightarrow{F} 14 [\delta(f-9) + \delta(f+9)]$$

$$28 \cos(18\pi(t-1/2)) \xrightarrow{F} 14 [\delta(f-9) + \delta(f+9)] e^{-j\pi f}$$

3. $15 \sin(90\pi t) \cos(400\pi t) \xrightarrow{F} A [\delta(f-b) + \delta(f+c) - \delta(f-c) - \delta(f+b)]$

$$15 \sin(90\pi t) \cos(400\pi t) \xrightarrow{F} 15 \times (j/2) [\delta(f+45) - \delta(f-45)] * (1/2) [\delta(f-200) + \delta(f+200)]$$

$$15 \sin(90\pi t) \cos(400\pi t) \xrightarrow{F} (j15/4) [\delta(f-155) + \delta(f+245) - \delta(f-245) - \delta(f+155)]$$

4. $\frac{d}{dt}(A \text{tri}(t/b)) \xrightarrow{F} j12\pi f \text{sinc}^2(4f)$

$$\frac{d}{dt}((3/2) \text{tri}(t/4)) \xrightarrow{F} j2\pi f \times 6 \text{sinc}^2(4f)$$

$$\frac{d}{dt}((3/2) \text{tri}(t/4)) \xrightarrow{F} j12\pi f \text{sinc}^2(4f)$$

5. $A \text{sinc}(bt) \xrightarrow{F} 22 \text{rect}(16\omega)$

$$\text{sinc}(t) \xrightarrow{F} \text{rect}(f)$$

$$\text{sinc}(t) \xrightarrow{F} \text{rect}(\omega/2\pi)$$

$$(1/32\pi) \text{sinc}(t/32\pi) \xrightarrow{F} \text{rect}(16\omega)$$

$$(11/16\pi) \text{sinc}(t/32\pi) \xrightarrow{F} 22 \text{rect}(16\omega)$$