

## MAT 321

## Quiz 3

## Spring 2021

1. Suppose that a continuous domain function  $f$  (in SPW4) is even. Choose an equivalent form for the conjugate of the Fourier Transform of  $f$ , or  $\overline{\mathcal{F}f}$ :

a)  $-\mathcal{F}f^-$       b)  $\mathcal{F}^{-1}\overline{f}$       c)  $(\mathcal{F}^{-1}f)^-$       d)  $\mathcal{F}\overline{f}$       e)  $\mathcal{F}f^{-1}$

Correct Answer:  $\mathcal{F}^{-1}\overline{f}$

2. Suppose that a continuous domain function  $f$  is imaginary-valued. Choose an equivalent form for the conjugate of the Fourier Transform of  $f$ , or  $\overline{\mathcal{F}f}$ :

a)  $-\mathcal{F}^{-1}f^-$       b)  $(\mathcal{F}^{-1}f)^-$       c)  $-\mathcal{F}f^-$       d)  $\mathcal{F}f$       e)  $\mathcal{F}f^{-1}$

Correct Answer:  $-\mathcal{F}f^-$

3. Suppose that a continuous domain function  $f$  is imaginary-valued and odd. Which of the following expressions are equivalent to the conjugate of the Fourier Transform of  $f$ , or  $\overline{\mathcal{F}f}$ ?

i)  $\mathcal{F}f$       ii)  $-\mathcal{F}^{-1}f$       iii)  $-(\mathcal{F}f)^-$

a) all of them      b) none of them      c) ii) and iii) only      d) i) and ii) only      e) i) and iii) only

Correct Answer: ii) and iii) only

4. Suppose that a continuous domain function  $f$  is real-valued and even. Which of the following expressions are equivalent to the Fourier Transform of  $f$ ?

i)  $\mathcal{F}f^-$       ii)  $\mathcal{F}^{-1}f$       iii)  $(\mathcal{F}f)^-$

a) all of them      b) none of them      c) ii) and iii) only      d) i) and ii) only      e) i) and iii) only

Correct Answer: all of them

5. Suppose  $f$  is a finite domain signal with values in  $\mathbb{C}^N$ . Which of the following expressions are equivalent to the Fourier Transform (DFT) of  $f^-$ ? (Use the symbol  $\mathcal{F}f$  here to denote DFT)

i)  $N\mathcal{F}^{-1}f$       ii)  $\frac{1}{N}\mathcal{F}f$       iii)  $(\mathcal{F}f)^-$

a) all of them      b) none of them      c) ii) and iii) only      d) i) and ii) only      e) i) and iii) only

Correct Answer: i) and iii) only

6. Suppose  $f$  is a finite domain signal with values in  $\mathbb{C}^N$ . Which of the following expressions are equivalent to  $\mathcal{F}^4 f = \mathcal{F}\mathcal{F}\mathcal{F}\mathcal{F}f$ ? (Use the symbol  $\mathcal{F}f$  here to denote DFT)

i)  $N^2 f$       ii)  $-\frac{1}{N^2}\mathcal{F}^{-1}f$       iii)  $\mathcal{F}(N^2\mathcal{F}^{-1}f)$

a) all of them      b) none of them      c) ii) and iii) only      d) i) and ii) only      e) i) and iii) only

Correct Answer: i) and iii) only

7. According to the time-frequency correspondence, if a discrete-time signal  $x_t$  is shifted (or delayed) by one sample, then the Fourier Transform  $F(\omega)$  of  $x$  becomes:

a)  $e^{i\omega t}F(\omega)$       b)  $e^{-i\omega}F(\omega)$       c)  $e^{iF(\omega)}$       d)  $e^{-iF(\omega)}$       e)  $F(e^{-i\omega})$

Correct Answer:  $e^{-i\omega}F(\omega)$

8. According to the time-frequency correspondence, if a discrete-time signal  $x_t$  has Fourier Transform  $F(\omega)$ , then a shift of this transform, say  $G(\omega) = F(\omega - \alpha)$  is equal to the Fourier Transform of a signal  $y_t$  given by:

a)  $e^{i\alpha t}x_t$       b)  $e^{i\alpha x_t}$       c)  $e^{-i\alpha t} + x_t$       d)  $e^{i\alpha t}$       e)  $e^{-i\alpha t}x_\alpha$

Correct Answer:  $e^{i\alpha t}x_t$