## Benjamin Walter Assignment Discrete\_Fourier due 02/02/2022 at 02:12pm EET

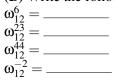
Problem 1. (1 point) METUNCC/Applied\_Math/fourier/Omega.pg

In your answers below you may use sqrt (), but no trig functions, complex multiplication, or powers.

(A) Write the primitive 12<sup>th</sup> root of unity in the counter-clockwise and clockwise directions.

 $\begin{array}{c} \omega_{12} = \underline{\qquad} \\ \overline{\omega_{12}} = \underline{\qquad} \end{array}$ 

**(B)** Write the following roots of unity in the form a + bi.



Problem 2. (1 point) METUNCC/Applied\_Math/fourier/Disc\_Fourier.pg

In your answers below you may use sqrt (), but no trig functions, complex multiplication, or powers.

(A) Compute the discrete Fourier transform of  $\vec{\mathbf{f}} = (4, -4, 0, 2)$ .

$$\mathcal{F}\left\{\vec{\mathbf{f}}\right\} = \left( \underline{\qquad}, \underline{\qquad}, \underline{\qquad}, \underline{\qquad}, \underline{\qquad} \right)$$

(B) Compute the discrete Fourier transform of  $\vec{\mathbf{g}} = (1,0,2)$ .

 $\mathcal{F}\left\{\vec{\mathbf{g}}\right\} = \left( \_\_\_, \_\_\_, \_\_\_\right)$ 

Problem 3. (1 point) METUNCC/Applied\_Math/fourier/Disc\_InvFour.pg

In your answers below you may use sqrt (), but no trig functions, complex multiplication, or powers.

(A) Compute the discrete inverse Fourier transform of  $\vec{\mathbf{c}} = \left(\frac{13}{4}, \frac{-2+3i}{4}, \frac{3}{4}, \frac{-2-3i}{4}\right).$ 

- $\mathcal{F}^{-1}\left\{ \vec{\mathbf{c}} \right\} = \left( \underline{\qquad}, \underline{\qquad}, \underline{\qquad}, \underline{\qquad} \right)$
- **(B)** Compute the discrete inverse Fourier transform of  $\vec{\mathbf{d}} = \left(\frac{5}{3}, \frac{7-5\sqrt{3}i}{6}, \frac{7+5\sqrt{3}i}{6}\right).$

$$\mathcal{F}^{-1}\left\{ \vec{\mathbf{d}} \right\} = \left( \underline{\qquad}, \underline{\qquad}, \underline{\qquad} \right)$$

**Problem 4. (1 point)** METUNCC/Applied\_Math/fourier/Disc\_Fourier\_f.pg In the parts below your answer must be entered using sqrt(). (Use of sin() and cos() is disabled.)

(A) Compute the discrete Fourier transform of f = t + 2 on [0,3) with length 4.

 $\mathcal{F}\left\{\vec{\mathbf{f}}\right\} = \left( \underline{\qquad}, \underline{\qquad}, \underline{\qquad}, \underline{\qquad} \right)$ 

(B) Compute the discrete Fourier transform of g = 2t + 2 on [1,4) with length 3.

 $\mathcal{F}\left\{\vec{\mathbf{g}}\right\} = \left( \underbrace{\qquad}, \underbrace{\qquad}, \underbrace{\qquad}, \underbrace{\qquad}\right)$ 

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