**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 $12^{\text{th}}$ root of unity in the counter-clockwise and clockwise directions.

$\omega_{12} =$ ______

$\overline{\omega_{12}} =$ ______

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

$\omega_{12}^{6} =$ ______

$\omega_{12}^{23} =$ ______

$\omega_{12}^{44} =$ ______

$\omega_{12}^{-2} =$ ______

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**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 $\vec{\mathbf{f}} = (4, -4, 0, 2)$.

$$\mathcal{F}\left\{\vec{\mathbf{f}}\right\} = \Big(\text{\_\_\_\_},\ \text{\_\_\_\_},\ \text{\_\_\_\_},\ \text{\_\_\_\_}\Big)$$

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

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

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**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 $\vec{\mathbf{c}} = \left(\frac{13}{4}, \frac{-2+3i}{4}, \frac{3}{4}, \frac{-2-3i}{4}\right)$.

$$\mathcal{F}^{-1}\left\{\vec{\mathbf{c}}\right\} = \Big(\text{\_\_\_\_},\ \text{\_\_\_\_},\ \text{\_\_\_\_},\ \text{\_\_\_\_}\Big)$$

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

$$\mathcal{F}^{-1}\left\{\vec{\mathbf{d}}\right\} = \Big(\text{\_\_\_\_\_\_},\ \text{\_\_\_\_\_\_},\ \text{\_\_\_\_\_\_}\Big)$$

**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.

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

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

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