

AEM2(Class 15, Midterm Exam) 2021.10.25

Department:

Student Id Number:

Student Name:

Important Notice:

1. Send your solution by email to twjeong@jbnu.ac.kr by 10:50, Oct. 25.
2. File name of your solution:
AEM2_Midterm_2021-2_YourName_Id-Number.
3. Show your solutions in detail. No points will be allowed for solutions without intermediate procedure.
4. Partial points are given for incorrect or partial solution.
5. Each of ten problems has the same weighting factor.
6. May use any material, but other person's help is strictly prohibited.

1. Express $f(x)$ by the Fourier series

$$\text{where } f(x) = \begin{cases} -2, & -\pi < x \leq 0 \\ 1 & 0 < x \leq \pi \end{cases}, \quad f(x) = f(x + 2\pi).$$

2. Express $f(x)$ by the Fourier series where $f(x) = |x-2|$ for $0 < x \leq 4$,
 $f(x) = f(x+4)$.
3. Show that $f(x)=3x^2-1$ and $g(x)=35x^4-30x^2+3$ are orthogonal to each other on $[-1, 1]$.
4. Express $f(x)$ by the Fourier integral where $f(x) = \begin{cases} -2, & -3 < x < 3 \\ 0 & \text{otherwise.} \end{cases}$
5. By integration find the Fourier transform of $f(x)=2x+1$ if $|x|<1$ and $f(x)=0$ otherwise.
6. Find the DFT of $[1, 2, 0]$.

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7. Find answers in rectangular form.

(a) $2 \angle \pi/6 + 4 \angle 60^\circ =$

(b) $(2 \angle \pi/3)/(4 + i3) =$

(c) $(3 - i4)/(4 + i2)^* =$

(d) $(2 \angle 3\pi/4) \cdot 5 \angle 60^\circ =$

8. Find the values of $z = \sqrt[5]{2 + 3i}$ in rectangular form.

9. Answer the following questions.

(a) Determine whether $f(z) = 3z^2 - zz^*$ is differentiable.

(b) Let $f(z)$ be a complex function which is not constant. Is it possible for both $f(z)$ and $[f(z)]^*$ to be analytic?

10. (a) Solve $e^z = 5 - 12i$.

(b) Solve $\sin z = 10$.

(c) Express $\text{Ln}(5 - 12i)$ in rectangular form.

(d) Express principal value of $(3 - 4i)^{2+3i}$ in polar form.