Assignment # 01 MTH403 (Fall 2022)

Maximum Marks: 10
Due Date: November 25, 2022

DON'T MISS THESE: Important instructions before attempting the solution of this assignment:

- **To solve this assignment, you should have good command over 1 - 7 lectures.**

  Try to get the concepts, consolidate your concepts and ideas from these questions which you learn in the 1 to 7 lectures.
- **Upload assignments properly through LMS, No assignment will be accepted through email.**
- **Write your ID on the top of your solution file.**

  Don't use colorful back grounds in your solution files.

  Use Math Type or Equation Editor Etc. for mathematical symbols.

  You should remember that if we found the solution files of some students are same then we will reward zero marks to all those students.

  Try to make solution by yourself and protect your work from other students, otherwise you and the student who send same solution file as you will be given zero marks.

  Also remember that you are supposed to submit your assignment in Word format any other like scan images, etc. will not be accepted and we will give zero marks correspond to these assignments.

Question # 1:

Find real x and y if $(x - iy)\,(3 + 5i)$ is the conjugate of $-6 - 24i$.

SOLUTION:

According to condition

$(x - iy)(3 + 5i) = -6 - 24i$

$3x + 5xi - 3yi - 5yi^2 = -6 + 24i$

$3x + 5xi - 3yi - 5y(-1) = -6 + 24i$ $\quad\quad \therefore i^2 = -1$

$3x + 5xi - 3yi + 5y = -6 + 24i$

$(3x + 5y) + i(5x - 3y) = -6 + 24i$

By comparing

$3x + 5y = -6 \ldots \ldots \ldots \ldots (1)$

$5x - 3y = 24 \ldots \ldots \ldots .. (2)$

Multiply equation (1) by 3 and equation (2) by 5 then add

$(9x + 15y) + (25x - 15y) = -18 + 110$

$9x + 15y + 25x - 15y = 92$

$34x = 92$

$x = \frac{92}{34} = 3$

$x = 3$

Putting x = 3 in equation (1)

$3(3) + 5y = -6$

$9 + 5y = -6$

$5y = -6 - 9$

$5y = -15$

$y = \frac{-15}{5} = -3$

$y = -3$

Question # 2:

Simplify $(\sqrt{3} + 3i)^{31}$ by using De-Moiver's theorem.

SOLUTION:

Here $z = (\sqrt{3} + 3) \quad and\ n = 31$

We know that

$z^n = r^n(cosn\theta + isinn\theta)$

So, first we find r and θ

$r = \sqrt{(\sqrt{3})^2 + (3)^2} = \sqrt{12} = 2\sqrt{3}$

$\alpha = tan^{-1}\left(\frac{3}{\sqrt{3}}\right) = tan^{-1}(\sqrt{3}) = \frac{\pi}{3}$

$\theta = \alpha = \frac{\pi}{3}$ $\quad (because\ z\ lie\ in\ 1st\ quadrant)$

So, the above equation become

$(\sqrt{3} + 3)^{31} = (2\sqrt{3})^{31}(\cos(31)\frac{\pi}{3} + isin(31)\frac{\pi}{3})$

$(\sqrt{3} + 3)^{31} = (2\sqrt{3})^{31}(\cos\frac{31\pi}{3} + isin\frac{31\pi}{3})$

$(\sqrt{3} + 3)^{31} = (2\sqrt{3})^{31}(\cos(10\pi + \frac{\pi}{3}) + isin(10\pi + \frac{\pi}{3}))$

$(\sqrt{3} + 3)^{31} = (2\sqrt{3})^{31}(cos\frac{\pi}{3} + isin\frac{\pi}{3})$

$(\sqrt{3} + 3)^{31} = (2\sqrt{3})^{31}(\frac{1}{2} + i\frac{\sqrt{3}}{2})$

DO NOT COPY PASTE SAME SOLUTION