MAT 320 Homework 1
Fall 2025

Due date: Wednesday, Sep 10

In the first ten problems find the Cartesian form of the complex number indicated. Simplify as much as possible but do not use decimals.

1. $(-2 + 3i)^2$

2. $(-2 + 3i)^3$

3. $e^{i\pi/3}$

4. $\cos\frac{\pi}{3} e^{i\pi/4}$

5. $e^{i\pi/3} + e^{-i\pi/3}$

6. $e^{i3\pi/4}$

7. $e^{i3\pi/4} + e^{-i\pi/4}$

8. $\displaystyle\sum_{k=0}^{7} e^{ik\pi/8} \; + \; \sum_{n=1}^{8} e^{-in\pi/8}$

9. $1 + i\dfrac{\pi}{2} + \dfrac{(i\frac{\pi}{2})^2}{2!} + \dfrac{(i\frac{\pi}{2})^3}{3!} + \dfrac{(i\frac{\pi}{2})^4}{4!} + \dfrac{(i\frac{\pi}{2})^5}{5!} + \cdots$

10. $1 + i\dfrac{\pi}{2} + (i\frac{\pi}{2})^2 + (i\frac{\pi}{2})^3 + (i\frac{\pi}{2})^4 + (i\frac{\pi}{2})^5$

In the next 10 problems, find a polar form $re^{i\theta}$:

11. $\frac{1}{2} + \frac{\sqrt{3}}{2}i$

12. $1 - \sqrt{3}i$

13. $2i(1 + i)$

14. $(1 + i)^8$

15. $(-1 + i)^8$

16. $1 + e^{i\frac{\pi}{2}} + (e^{i\frac{\pi}{2}})^2$

17. $\cos(-\frac{\pi}{3}) + \sin(\frac{\pi}{3})i$

18. $\cos(-\frac{\pi}{3}) - \sin(\frac{\pi}{3})i$

19. $(\cos(\frac{\pi}{3}) + \sin(\frac{\pi}{3})i)^3$

20. $1 + i\dfrac{\pi}{2} + \dfrac{(i\frac{\pi}{2})^2}{2!} + \dfrac{(i\frac{\pi}{2})^3}{3!} + \dfrac{(i\frac{\pi}{2})^4}{4!} + \dfrac{(i\frac{\pi}{2})^5}{5!} + \cdots$