MTH 162, Homework #5, Spring 2025 Name _____

Instructions: Write your work up neatly and attach to this page. Record your final answers (only) directly on this page if they are short; if too long indicate which page of the work the answer is on and mark it clearly. Use exact values unless specifically asked to round.

1. Plot each number in the complex plane and find its magnitude.
   a. $z = 4i$ b. $2 + 3i$ c. $-3 - 4i$ d. $3 - i$ e. $2 + 5i$ f. 2

2. Write each complex number in polar form.
   a. $2 + 2i$ b. $-2 + 2i\sqrt{3}$ c. $-2 + 3i$ d. $1 - i\sqrt{5}$

3. Write each complex number in rectangular form.
   a. $6\left(\cos\frac{\pi}{6} + i\sin\frac{\pi}{6}\right)$ c. $8\left(\cos\frac{7\pi}{4} + i\sin\frac{7\pi}{4}\right)$
   b. $5\left(\cos\frac{\pi}{2} + i\sin\frac{\pi}{2}\right)$ d. $20(\cos 205° + i\sin 205°)$

4. Find $z_1 z_2$ and $\frac{z_1}{z_2}$ of the complex numbers.
   a. $z_1 = 6(\cos 20° + i\sin 20°), z_2 = 5(\cos 50° + i\sin 50°)$
   b. $z_1 = 3\left(\cos\frac{5\pi}{8} + i\sin\frac{5\pi}{8}\right), z_2 = 4\left(\cos\frac{\pi}{16} + i\sin\frac{\pi}{16}\right)$
   c. $z_1 = 1 + i, z_2 = -1 + i$
   d. $z_1 = 1 + i, z_2 = 2 - 3i$

5. Use DeMoivre's Theorem to find the indicated power.
   a. $[2(\cos 15° + i\sin 15°)]^3$ d. $\left[3\left(\cos\frac{\pi}{4} + i\sin\frac{\pi}{4}\right)\right]^5$
   b. $\left[\frac{1}{\sqrt{2}}\left(\cos\frac{5\pi}{18} + i\sin\frac{5\pi}{18}\right)\right]^6$ e. $\left(\sqrt{2} - i\right)^7$
   c. $(1 + i)^4$

6. Find all the complex roots.
   a. Complex square roots of $9\left(\cos\frac{5\pi}{3} + i\sin\frac{5\pi}{3}\right)$
   b. Complex cube roots of $27(\cos 306° + i\sin 306°)$
   c. Complex fourth roots of $4\left(\cos\frac{4\pi}{3} + i\sin\frac{4\pi}{3}\right)$
   d. Complex fifth roots of $1 + i$
   e. Complex cube, fourth, fifth and sixth roots of 1
   f. Complex cube, fourth, fifth and sixth roots of $-i$