Math 162 - Spring 2025
Workshop 9
March 31 - April 4
Calculus of Polar Curves and Sequences

Problem 1. Sketch the curve $r = 1 + \cos(\theta)$ and find the length of the curve.

Problem 2. Sketch the five petaled rose $r = \cos(5\theta)$. Find the area of the region bounded by one loop of this curve.

Problem 3. For each of the following sequences, write out the first four terms. Then determine if the sequences converge and diverge. If they converge, find the limit.

1. $a_n = \dfrac{3 + 5n^2}{n + n^2}$
2. $\{\dfrac{(2n-1)!}{(2n+1)!}\}$
3. $\{n^2 e^{-n}\}$

Problem 4. Define the sequence a_n by $a_1 = \sqrt{2}$ and recursively by $a_{n+1} = \sqrt{2 + a_n}$ for all positive integers n.

1. Use induction to show that a_n is a monotonically increasing sequence.
2. Show that a_n is bounded by showing that $a_n > 0$ and $a_n < 3$ for all $n > 0$.
3. By the Monotone Sequence Theorem, we know that a_n converges. Find the limit of a_n.