Write-up your solution carefully including all the details of the proof. Due Tuesday September 21.

Please staple your assignment.

1. (5 points) Solve \( x^3 - x + 1 = 0 \).

2. (5 points) Solve \( x^4 = -4 \) by using the general method of solving equations of degree 4.

3. (5 points) For all complex numbers \( z \neq 0 \) show that
\[
\frac{z}{|z|} + \frac{|z|}{z}
\]
is a real number.

4. (5 points) Let \( f(x) = kX^k - X^{k-1} - X^{k-2} - \ldots - X - 1 \), where \( k \geq 1 \) integer. Show that the roots of \( f \) have the absolute value less or equal to 1.

5. (5 points)(graduate students) Show that for all positive integers \( n \) the real roots of the following equation:
\[
x^{2n+1} - x^{2n} + x^{2n-1} + 2nx^n - n^2 = 0
\]
are positive.