Homework # 9 (Due Friday, February 28).

- Read Chapter 8 in the textbook.

Do the following problems:

1 Find the value of K such that the roots of $X^3 - 3X^2 + KX + 3 = 0$ are in arithmetic progression (i.e. are α, $\alpha+d$, $\alpha+2d$ for some d). Solve the equation for this value of K.

2. Use mathematical induction to prove the following:

a) $\sum_{r=1}^{n} r^2 = \frac{1}{6} n(n+1)(2n+1)$ for all $n \geq 1$.

b) $a + aq + aq^2 + \ldots + aq^{n-1} = \frac{aq^n - 1}{q-1}$, for all a, $q \neq 1$, and $n > 0$.

c) For all integer $n > 1$, $n^3 - n$ is divisible by 6.

d) $\sum_{r=1}^{n} \frac{1}{r(r+2)} = \frac{3}{4} - \frac{2n+3}{2(n+1)(n+2)}$ for $n \geq 1$.

e) $2^n > n^3$ for all $n \geq 10$.

f) Prove that $4^n - 3n - 1$ is divisible by 9 for $n = 2, 3, 4, \ldots$