## E-Exam 342

Use the following link to answer the questions.
http://www.d.umn.edu/~jgallian/msproject06/project_xukai7.html

## Chapter (1)

## Exersice 1.

a. Find elements of $U(30)$.
b. Find the inverse of each member of $\boldsymbol{U}(30)$.

## Exercise 2.

Guess a formula for the size of $U\left(p^{n}\right)$. Make a conjecture about the relationship between the size of $U\left(2 p^{n}\right)$ and the size of $U\left(p^{n}\right)$ where $p$ is a prime greater than 2 .

## Exercise 3.

This software computes the inverse of any element in $G L\left(2, Z_{p}\right)$, where $p$ is a prime. Computes the inverse of $\left[\begin{array}{ll}2 & 4 \\ 6 & 8\end{array}\right] \bmod 11$

## Chapter (3)

## Exercise 1.

Run the program for $\boldsymbol{n}=30$ to determine all cyclic subgroups. Compare the order of the subgroups with the order of the group itself. What arithmetic relationship do these integers have?

## Chapter (4)

## Exercise 1.

This software determines if $U(n)$ is cyclic. Run the program for $n=8,16,32,64$, and 128. Make a conjecture. Run the program for $3,9,27,81,343,5,25,125,7$, 49, 11, and 121. Make a conjecture. Run the program for $n=12,20,28,44,52$, $15,21,33,39,51,57,69,35,55,65$, and 85 . Make a conjecture.

