

Math 2250-1 Maple Project 2

Summer 2009 Due Friday 7/3

Directions: Hand in a single Maple document, printed and stapled neatly, which contains the answers to the exercises below. At the top of this document, you should create a text field with an appropriate title, the date, your name, and UID. Below this header, please answer the exercises in order. If an exercise calls for computations by hand, you can type up your solutions in a text field, or leave enough space so that you can hand-write your computation/explanation after printing the document.

Maple Help: Maple has an extensive Help menu! You can search for commands to find syntax, related commands, and extensive examples. Additionally, there are some introduction to Maple guides posted on our class webpage (www.math.utah.edu/kitchen/2250Sum09). You can also get help from tutors in the tutoring center, and follow the guidelines in the book as necessary.

Exercises: We'll be working with matrices in this assignment, so you will need to include the linear algebra package by entering the command `with(LinearAlgebra)` before doing anything else! If you want to begin working before the demo next week, search for the `LinearAlgebra` package in the help browser of Maple and find the list of commands for the package. They are all conveniently named, and will be linked to their respective help pages, which will have instructions on syntax and examples.

1. Elementary Operations

- Generate a random 3×3 matrix in Maple.
- Display the first column of your matrix, then display the first row. Finally, display the (2,3) entry of your matrix.
- Use elementary operations to put your matrix in reduced echelon form.
- Use the command `ReducedRowEchelonForm` to have Maple do the row reductions.
- Enter the augmented coefficient matrix for the linear system

$$\begin{aligned} 322x_1 - 163x_2 + 231x_3 - 455x_4 &= 899 \\ 107x_1 - 181x_2 + 428x_3 - 571x_4 &= 445 \\ 351x_1 - 144x_2 + 421x_3 - 936x_4 &= 848 \\ 111x_1 - 709x_2 + 484x_3 + 625x_4 &= 421 \end{aligned} \tag{1}$$

as a matrix in Maple and solve it using the same command as in part (d). Present your solution as a column vector.

2. Application of Linear Systems Use Maple to solve the following word problem:

You are walking down the street minding your own business when you spot a small but heavy leather bag lying on the sidewalk. It turns out to contain U.S. Mint American Eagle gold coins of the following types:

- One-half ounce gold coins that sell for \$ 285 each,
- One-quarter ounce gold coins that sell for \$ 150 each, and

- One-tenth ounce gold coins that sell for \$ 70 each.

You weigh the following three options (a) keep the money, (b) give it to a bank, (c) hide it in a treasure chest at the bottom of the ocean, and realize your decision of what to do with the money will depend on how many coins of each type there are. A bank receipt found in the bag certifies that it contains 258 coins with a total weight of 67 ounces and a total value of exactly \$ 40,145. Set up a 3×3 linear system, then solve the system to find how many coins there are of each type by inverting the coefficient matrix using Maple.

3. Vector Spaces

Use Maple to find a basis for the solution space of the homogeneous linear system given in problem 26 of section 4.4 of the text.