**Culminating Task: Vacationing in Georgia**

I. Your family is planning to spend a week’s vacation traveling in Georgia. First, your parents need to design a budget for the trip. The trip will begin in Atlanta and they estimate spending $60 on gas, $180 on food, $200 on activities, and $40 on souvenirs. Next, you will visit family in Albany. Your parents estimate the cost for this leg of their journey will be $45 on gas, $50 on food, and $20 on activities. Finally, you all will visit Savannah and estimate spending $90 on gas, $200 on food, $100 on activities, and $75 on souvenirs.

1. Construct a 3x4 matrix \([V]\) to represent all the costs involved in this vacation.

2. Could a 4x3 matrix be used instead? Explain.

3. The sales tax in Georgia is 7%. Write a matrix \([T]\) representing the taxes for each expenditure.

4. Compute a cost including tax matrix \([C]\) to represent their anticipated expenditures.

5. What is the entry in matrix \([C]\) denoted as \(c_{31}\) and what is its meaning?

6. What is the sum of the third row in matrix \([C]\) what does it mean?

7. What is the sum of the first column in matrix \([C]\) and what does it mean?

II. Everyone in your family knows you are an excellent math student. Therefore, whenever math problems arise on this vacation, they ask you to solve them. Solve the following and show or explain how you solved them.
8. Your father said he had earned the money for this vacation through interest earned in
an investment portfolio. He had $25,000 invested in two types of accounts: a municipal bond
that earned 3% annual interest and a mutual fund that earned 9% annual interest. If he made
$1830.00 in interest for the year, how much was invested in each type of account.

9. Your aunt and uncle in Albany are planning a birthday party for their youngest child
at a skating rink. The cost of admission is $3.50 per adult and $2.25 per child, and there is a
limit of 20 people. They have $50 to spend. Determine how many adults and how many
children can be invited.

10. While in Savannah, you met a vendor selling frozen yogurt by the river. He said he
had made $565 and used 250 cones that day. If a single-scoop cone cost $2 and a double-scoop
cone cost $2.50, how many of each type of cone did he sell?

11. At Lenox Mall in Atlanta, you and two other members of your family wanted to eat
Chinese food. You found a Chinese restaurant and ordered three different luncheon combination
platters. Mom ordered 2 portions of fried rice and 1 portion of chicken chow mein. Your sister
ordered 1 portion of fried rice, 1 portion of chicken chow mein, and 1 eggroll. You ordered 2
portions of chicken chow mein and 1 eggroll. Your mother’s platter cost $5, your sister’s cost
$5.25, and yours cost $5.75. How much did 1 eggroll cost?

12. You were elected the student council president for the next year at your school.
After vacation is over, you have to plan a school carnival for the new school year. You are
studying last year’s event and know that 210 people attended last year’s school carnival. The
total amount of money collected for tickets was $710. Prices were $5 for regular admission, $3
for students, and $1 for children. The number of regular tickets sold was 10 more than twice the
number of children’s tickets sold. Determine how many of each kind of ticket were sold.

III. Although you enjoyed your vacation, riding in a car with your family was pretty annoying.
You are hoping next time, you could fly. The next part of this task will have you analyze a
Network of Georgia Air-Taxis.
The diagram above shows a map of the routes taken by Georgia Air-Taxi airline. On this diagram lengths and directions are irrelevant; all that matters is the connections between airports.

13. Construct a route matrix for this network in which 1 indicates that there is a direct route between two airports (nodes) and a 0 indicates that there is no direct flight between airports. (Please define the rows and columns in alphabetical order.)

14. Use Technology to find the square of the route matrix found in 13.

15. By multiplying a route matrix by itself the resulting matrix shows the number of two-stage routes connecting the airports. For example, the 1 route shown for Dalton to Dalton arises because it is possible to fly from Dalton to Atlanta back to Dalton. Your square matrix should have one element with a value of 4 and two with a value of 3. Describe all the two-stage routes these numbers represent.
a. List all the two-stage routes that the element 4 represents in your square matrix:

b. List all the two-stage routes that the element 3 represents in your square matrix:

c. List all the two-stage routes that the other element 3 represents in your square matrix:
16. a. Construct a route matrix for the network shown in the diagram. Lines with only one arrow indicate that the flow of traffic is in one direction only. Note that it is possible to take a route from Columbia back to itself and that the journey can be taken in two directions.

b. Find the square of the route matrix and describe a two stage route that the new matrix indicates.

c. Find the cube of the route matrix, what do you think this represents? Finally, take the element 4 in the cubed matrix and describe all the routes its represents.