1. A stolen car, chased by a police car, strikes and damages a truck while passing it. In statements regarding the incident, the truck driver says that the stolen car was going 3 times as fast as the truck, the policeman says he was going 20 miles per hour faster than the stolen car and the car thief estimates that the sum of the speeds of the police car and the stolen car equaled 6 times the speed of the truck. Determine the speeds of the stolen car, the police car and the truck or show that the statements of the three drivers contradict one another.

2. Let \( f(x, y) = \sqrt{y - x^2} \)

   Find the domain and range of this function.
   Sketch level curves for values 0, \( \frac{1}{2} \), 1, 2 and 3
   Thinking about the level curves, describe the shape of the surface. Or use technology to do this.

3. Ronnel wants to buy fish and plants for her new aquarium. Each fish costs $2 and each plant costs $1.75. She buys 14 items and spends $26. How many of fish and how many plants did she buy?

   Set up a matrix equation and use matrix methods to solve.
4) Match the contour plot with the surface and give a reason for your choice. (use a sentence)
First, read the entire question.

5. Lionfish are an invasive and destructive species to reef habitats. They have established populations on the eastern seaboard of the United States and in the Caribbean. They are not native to these areas and have no predators there and they are decimating the populations of native fish. No one is sure how they got there, but many believe that it is due to people dumping unwanted lionfish from their home aquariums.

A female juvenile lionfish has a 0.77 chance of surviving until the next month and not maturing. A female juvenile lionfish has a probability of 0.07 of surviving until the next month and maturing. The others perish. An adult female lionfish has a probability of 0.9 that she will survive until the next month and an adult female lionfish produces 4 female lionfish each month.

a) Set up a population model \( \mathbf{U}_{n+1} = A \mathbf{U}_n \), where \( \mathbf{U} \) is the vector that gives the number of female juveniles in the population and the number of female adults.

b) Suppose \( \mathbf{U}_0 = \begin{bmatrix} 4 \\ 2 \end{bmatrix} \). Iterate the model for 4 months and make a prediction about the total population and the ratio of female juveniles to the total population.

c) Use the theory that we developed in class to find the long term growth rate of this population and the long term ratio of juvenile females to the total lionfish population.

d) What is your conclusion about the fate of the lionfish population?

e) You can see that adult survivorship greatly impacts the population growth rate. You and your team have developed a method where you will vigorously implement a program to reduce adult survivorship probability to 0.6.
What effect will this have on the population?

f) Find the solution to this problem, that is, find an expression for \( \mathbf{U}_n \).