

## Problem set: Using the adjugate and determinant of a matrix to solve real world problems

Name: \_\_\_\_\_

Precalculus

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**Be sure to...** Do all work in your notebook. If you don't complete work in class, finish at home. Submit on Google Classroom.

1. For the matrices below, **be sure to** (i) find the determinant and adjugate for each, then (ii) use these to find the inverse of the matrix (if possible). If an inverse can't be found, explain why not:

(a)  $A = \begin{bmatrix} 6 & -7 \\ -3 & 4 \end{bmatrix}$

(b)  $A = \begin{bmatrix} 6 & 12 \\ 2 & 4 \end{bmatrix}$

2. For the system of linear equations below, **be sure to**:

- i. Convert into a matrix equation  $AX = B$
- ii. Find the determinant and adjugate for A
- iii. Find the inverse of A
- iv. Use the inverse of A to solve the system of equations

$$\begin{cases} 5x + 4y = 3 \\ 2x + 2y = 4 \end{cases}$$

3. Dr. Galvez and Dr. Guillermo are testing a new experimental medicine (Precalodine) at Montefiore Hospital. The medicine is being given to a total of 100 patients. Patients take the medicine in a 1 liter solution, meaning that some percent of the solution is the medicine, and the rest is water. If patients are being given 2% or 4% solutions, and 2.5 liters of the medicine are on hand, how many patients will be given the 2% solution and how many should be given the 4%, with all the medicine used up?

**Be sure to:**

- (a) Create a system of linear equations corresponding to this problem
  - (b) Rewrite your system of equations as  $AX = B$
  - (c) Use your knowledge of matrix adjugate and determinant to figure out how many patients can be given the 4% solution.
4. **Challenge!!!!** Now Dr. Galvez and Dr. Guillermo want to add a third 6% solution. If they still have 100 patients and now have 3.5 liters of Precalodine on hand, how many patients should be given each dose?

**Hint:** You'll be dealing with a  $3 \times 3$  matrix. Use the adjugate and determinant **calculator** on Google Classroom!