Math 341 Assignment 5, Winter 2017 **Due at the start of class on Thursday, February 9th**

The points of this assignment are to (1) understand what the determinant tells us about the solution (or lack of one) to a system of equations, and (2) use determinants with Cramer's rule for solving systems of equations. You will be using the following three systems:

$$\text{I.}\quad \begin{aligned} 4x - 8y &= -16 \\ -3x + 6y &= 12 \end{aligned} \qquad \text{II.}\quad \begin{aligned} 3x + 2y &= 3 \\ 5x + 4y &= 7 \end{aligned} \qquad \text{III.}\quad \begin{aligned} 4x - 8y &= 5 \\ -3x + 6y &= 3 \end{aligned}$$

You may use the Roman numeral of an equation to answer any of the following, *when that is appropriate.* **For Exercises 5 and 6, state your conclusions clearly and show examples supporting them.**

1. For which of the systems is the determinant of the coefficient matrix zero? What does that tell us about the solutions to those systems?
2. Use Cramer's rule to solve the system for which the determinant of the coefficient matrix is not zero. **Show very clearly how this is done.**
3. One of the systems has infinitely many solutions. Give the general solution and three particular solutions for that system.
4. Suppose that the right hand side to the system with no solution was the zero vector. Would it then have a solution? If not, say so, if so, give it. If there are infinitely many solutions, give the general solution and three particular solutions.
5. Give one of your general solutions in linear combination form. Then determine whether the set of such vectors is closed under addition and/or scalar multiplication.
6. Give your other general solution in linear combination form. Then determine whether the set of such vectors is closed under addition and/or scalar multiplication.

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