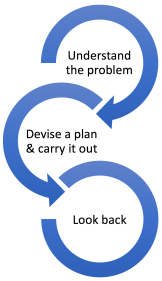
Problem Set 1

See the Guidelines, the Maple Commands/Template for Problem Set 1, and the Maple tips. **I will post on ASULearn answers to select questions I receive via messaging or in office hours. I am always happy to help!** You may work alone or in a group of up to 2 people and turn in one per group. The purpose of problem sets is to make connections and apply the material. Feel free to talk to me or each other if you are stuck, but be sure to acknowledge any sources outside me or your group, like "The insight for this solution came from a conversation with Joel." **Be sure to annotate in your own group's words**.



Mathematics, you see, is not a spectator sport. [George Polya, *How to Solve it*]

1. 1.1 # 14 using three methods (don't forget to annotate and to solve for the solutions like the book asks for):
   (a) by-hand Gaussian
   (b) ReducedRowEchelonForm in Maple
   (c) implicitplot3d in Maple and annotate what you see and how this connects to the question
   (d) Do all the methods yield the same solution(s)? Compare and contrast.

   Note for part (b) and (c), you can use commands like the following, but replacing with the coefficients from this question:
   with(plots): with(LinearAlgebra): colons on the packages suppress the output to save paper
   Pr1:=Matrix([[-1,2,1,-1],[2,4,-7,-8],[4,7,-3,3]]);
   ReducedRowEchelonForm(Pr1);
   implicitplot3d({-x+2*y+z=-1,2*x+4*y-7*z=-8,4*x+7*y-3*z=3},x=-4..4,y=-4..4,z=-4..4);

2. (a) 1.1 #25 using GaussianElimination in Maple and reason from there
   (b) Use your equation from part (a) to choose values for g, h, and k so that the system is consistent.
   (c) Next, produce parametric solutions to the linear system you created in part (b).
   (d) Use ReducedRowEchelonForm in Maple on the original matrix in #25 with g, h, and k left as general and show that Maple gives an incorrect answer (recall we should only use ReducedRowEchelonForm when the array is all numbers) and then annotate: How many solutions do we obtain here and how is this different from part (c)?

3. 1.2 #30—produce the example and show that your example is inconsistent

4. First read through 1.2 #32 and the numerical note on page 20.
   (a) Compute the exact ratios of $\frac{\text{backwards}}{\text{total}} = \frac{\text{backwards}}{(\text{forwards} + \text{backwards})} = \frac{n^2}{\frac{2n^3}{3} + \frac{n^2}{2} - \frac{7n}{6} + n^2}$ for $n = 20$ and $n = 200$.
   (b) Give decimal approximations of these ratios for $n = 20$ and $n = 200$.
   (c) Is the ratio increasing, decreasing or staying constant as a function of n?
   (d) The forward phase is Gaussian, and the backward phase is from Gaussian to Gauss-Jordan, so interpret what part (c) is telling you in the language of Gaussian and Gauss-Jordan.