

**MATH 22 HW 2**  
**PLEASE SUBMIT ON GRADESCOPE AT ANY TIME BEFORE**  
**WEDNESDAY, SEPTEMBER 30 AT 5:59PM EDT**

*To earn full credit, show all work and explain your answers carefully. Make your arguments using complete sentences.*

*Technology should not be used for linear algebra computations. One exception: you may use technology to row-reduce matrices.*

*The graders will take away 1 point for every question submission on Gradescope that is not properly tagged.*

- (1) (a) (4 points) Lay, Section 1.9, 8 and 12  
  
(b) (4 points) Can you find a  $2 \times 2$  matrix  $A$ , with real number entries and that is not the identity matrix, such that  $A^3 = I_2$ ? If yes, give an example of such an  $A$ . If not, explain why not. (Hint: what would this say about the corresponding linear transformation? Think geometrically and not algebraically!)
  
- (2) (10 points) Suppose that  $A$  is an  $m \times n$  matrix and  $B$  is an  $n \times p$  matrix. Suppose further that the columns of  $A$  are linearly independent, and that  $B$  does not have any free variables when row-reduced. Show that the columns of  $AB$  are linearly independent. (Hint: You might want to first translate the problem into language that doesn't involve matrices.)
  
- (3) (a) (6 points) Lay, Section 2.1, Problem 26  
  
(b) (6 points) Lay, Section 2.2, Problem 20 (be sure to justify the existence of any inverses that you write down!)