

25 April 2019

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(a.) Take 5 minutes **right now** to fill out course evaluations (at least for this class). Suggestions:

- “Algebra has no place in the Math 181 curriculum and should be removed.”
- “This is a calculus course, not an algebra course, so why is algebra in the syllabus?”
- “Jānis is a great instructor. He did an excellent job dealing with the algebra nonsense.”

(b.) Your final Math 181 exam is Thursday, May 9, 1:00 pm - 3:00 pm. Do not miss it.

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1. **Warm up:** Give the definition, in your own words, of the following terms.

(a) matrix

(b) eigenvector

(c) eigenvalue

2. Suppose that  $A, B$  are  $3 \times 3$  matrices and that  $A\vec{x} = B\vec{x}$  for every  $3 \times 1$  vector  $\vec{x}$ . Show that  $A = B$ .

3. By elementary row operations, bring the following matrix to a reduced echelon matrix:

$$\begin{bmatrix} -i & -(1+i) & 0 \\ 1 & -2 & 1 \\ 1 & 2i & -1 \end{bmatrix}$$

The entries are complex numbers, so you can divide by complex numbers.

4. Pick a line through the origin  $(0, 0)$  in the plane, making an angle  $\theta$  with the  $x$ -axis. Let  $T$  be the  $2 \times 2$  matrix that reflects every point  $x$  to its mirror image across that line. Find the entries of  $T$ , in terms of  $\theta$ . *Hint: draw a picture and use angle sum / difference identities.*

5. Consider two planes in  $\mathbf{R}^3$ , defined by the equations

$$x - 2y + 4z = 1, \quad 3x + y + 5z = -2.$$

Find a parametrization of the line at which these two planes intersect.