MATH 54 – HINTS TO HOMEWORK 8

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Here are a couple of hints to Homework 8. Enjoy!

SECTION 3.2: PROPERTIES OF DETERMINANTS

3.2.11. What they mean is: First calculate the determinant by expanding along the second column, and then evaluate the resulting sub-determinants using row-reduction!

3.2.19. DO NOT EVALUATE THE DETERMINANT! Use row-reduction! In particular, notice that to obtain the determinant in the problem, all you have to do is multiply the second row of the original matrix by 2, and then add the first row to the second row! Hence, the answer should be $2 \times 7 = 14$.

3.2.21. A matrix A is invertible if and only if $det(A) \neq 0$.

Note: From now on, I'm only giving the answer to the T/F questions! I leave it up to you to explain why the result is true or false.

3.2.27.

(a) **T** ? I think the book uses the term 'row-replacement' to mean: " add k times a row to another row".
(b) **F** (not true for *any* echelon form, what about the reduced row-echelon form?)
(c) **T**
(d) **F**

3.2.31, 3.2.33, 3.2.34, 3.2.35. All you need to use is the fact that $det(AB) = det(A)det(B)$.

SECTION 3.3: CRAMER'S RULE, VOLUME, AND LINEAR TRANSFORMATIONS

For all those problems, all you need to do is imitate the techniques presented in the book.

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3.3.7. The system has a unique solution iff $det(A) \neq 0$ (because that's equivalent to saying that A is invertible)

3.3.21. The only thing that makes this difficult is that the parallelogram is not centered at $(0, 0)$. To make it centered at $(0, 0)$, just shift it to the right by one unit! The area stays the same anyway!

3.3.32.

(a) Define T by $T(e_i) = v_i$. Notice that this is enough to define T, because $\{e_1, e_2, e_3\}$ is a basis for $\mathbb{R}^3$.

(b) Now just use $Vol(S') = det(T)Vol(S)$. The volume of S is $\frac{1}{3} \times \frac{1}{2}(1 \times 1) \times 1 = \frac{1}{6}$, because all of its three lengths are equal to 1. As for $det(T)$, that's just the determinant of the matrix whose columns are v_1, v_2, v_3.