PSET 3 - DUE FEBRUARY 24

Note the date change for this Pset! Due Thursday at 11:00 a.m., before class.

1. Let $T : \mathbb{R}^n \to \mathbb{R}^n$ be a linear transformation and let P denote a paralellpiped in $\mathbb{R}^n$ formed by the vectors $\{v_1, \cdots, v_n\}$. Let $m(T)$ denote the matrix of the transformation of T using the standard basis in $\mathbb{R}^n$. Finally, let $T(P)$ denote the image of the parallelpiped under the transformation T. Prove

$$vol(T(P)) = |det(m(T))|vol(P).$$

(5 pts)

2. 14.4: 23 (5 pts)

3. Let P represent the plane containing the points $(1, 0, 0), (3, 2, 4), (1, -1, 1)$. Find the point on the plane that minimizes the distance between the plane and the origin.
Remark: You should solve this problem without using an optimization technique (don't take any derivatives). You can justify this point minimizes distance using the geometry of vectors. (5 pts)

4. 14.9:12 (5 pts)

5. 14.9:15 (5 pts)

6. 14.13:16 (5 pts)

The problems from Chapter 14 refer to Apostol Volume I.

18.024 Multivariable Calculus with Theory
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