

MTH 261

LINEAR ALGEBRA

SUMMER 2017

Determinant Applications

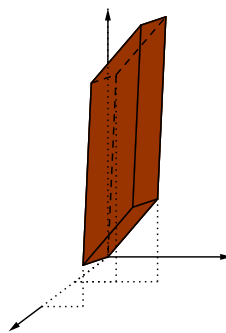
Find partners, and follow the instructions. You will not turn this in, but you must be working diligently to get attendance credit.

1. Find the area of the parallelogram in $\mathbb{R}^3$ with vertices at $(0, 0, 0)$, $(1, 2, -1)$, $(2, -3, -2)$, and $(3, -1, -3)$.
2. Find the area of the parallelogram in $\mathbb{R}^2$ with vertices at $(0, 0)$, $(3, 2)$, $(4, -7)$, and $(7, -5)$.
(Hint: embed $\mathbb{R}^2$ in $\mathbb{R}^3$ by identifying the xy -plane in $\mathbb{R}^3$ with $\mathbb{R}^2$ in the simplest way.)
3. A linear transformation T has standard matrix $A_T = \begin{bmatrix} 1 & 2 & -4 \\ 0 & 4 & 2 \\ 3 & -5 & 10 \end{bmatrix}$. If $\mathcal{C}$ is the standard unit cube in $\mathbb{R}^3$, what will the volume of $T(\mathcal{C})$ be?

4. Find $\vec{u} \times \vec{v}$, where $\vec{u} = \langle 5, 10, 12 \rangle$ and $\vec{v} = \langle 4, -3, 8 \rangle$.

5. Consider the parallelepiped P (in the figure) with vertices at

$$\begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix}, \begin{bmatrix} 2 \\ 1 \\ 1 \end{bmatrix}, \begin{bmatrix} 1 \\ 2 \\ 2 \end{bmatrix}, \begin{bmatrix} 1 \\ 1 \\ 5 \end{bmatrix}, \begin{bmatrix} 3 \\ 3 \\ 3 \end{bmatrix}, \begin{bmatrix} 2 \\ 3 \\ 7 \end{bmatrix}, \begin{bmatrix} 3 \\ 2 \\ 6 \end{bmatrix}, \begin{bmatrix} 4 \\ 4 \\ 8 \end{bmatrix}.$$



Find the volume enclosed by P .