Find the weight of
a parallelepiped of platinum
defined by three vectors (in metres):

$$\vec{r} = (50, 1, -2), \quad \vec{O} = (-20, 0, 50), \quad \vec{f} = (6, -2, 989).$$

Density $d = 40 \times 10^3$ lbs/m^3

$$\vec{c} = \vec{O} \times \vec{f} = \begin{vmatrix} \vec{i} & \vec{j} & \vec{k} \\ -20 & 0 & 50 \\ 6 & -2 & 989 \end{vmatrix} = 100\vec{i} + 20080\vec{j} + 40\vec{k}$$

$$\vec{c} \cdot \vec{r} = (100\vec{i} + 20080\vec{j} + 40\vec{k}) \cdot (50\vec{i} + \vec{j} - 2\vec{k})$$
$$= 5000\vec{i} \cdot \vec{i} + 20080\vec{j} \cdot \vec{j} - 80\vec{k} \cdot \vec{k} = 25 \times 10^3$$

Weight $= \vec{c} \cdot \vec{r}\, d = 25 \times 10^3\ \text{m}^3 \times 40 \times 10^3\ \text{lbs/m}^3 = 10^9\ \text{lbs}$

The answer is:

$$(\vec{O} \times \vec{f}) \cdot \vec{r}\, d = 1,000,000,000 \text{ pounds.}$$

Thank you

on behalf of the whole University

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