1. In each part find the equation of the sphere with center $(2,-1,-3)$ and satisfying the given conditions.
(a) (2 points) Tangent to the $x y$-plane
(b) (2 points ) Tangent to the $x$-axis
(c) (2 points ) Passes through the origin
2. A parallelogram has $\mathbf{i}-\mathbf{j}+\mathbf{k}, \mathbf{i}-3 \mathbf{j}+2 \mathbf{k}$ as adjacent sides. Find
(a) (2 points) Its area.
(b) (2 points) The lengths of its heights.
(c) (2 points) The lengths of its diagonals.
3. Given the points $P(-3,1,2), A(1.1 .0), B(-2,3,-4)$ find
(a) (2 points) $\operatorname{Proj}_{\overrightarrow{A B}} \overrightarrow{A P}$
(b) (2 points) The component of $\overrightarrow{A P}$ orthogonal to $\overrightarrow{A B}$
(c) (2 points) The distance from the point $P$ to the line through $A, B$.
4. Consider the parallelepipped with adjacent edges $\mathbf{u}=\langle 2,2,1\rangle, \mathbf{v}=$ $\langle 1,1,2\rangle, \mathbf{w}=\langle 1,3,3\rangle$.
(a) (2 points) Find the volume
(b) (2 points) Find the area of the face determined by $\mathbf{u}$ and $\mathbf{w}$.
(c) (2 points) Find the angle between $\mathbf{v}$ and the face determined by $\mathbf{u}$ and $\mathbf{w}$.
5. (4 points) Find parametric equations of the line through the point (5, 0, - 2 ) that is parallel to the planes $x-4 y+2 z=0$ and $2 x+3 y-z+1=0$.
6. (2 points) Find the equation of the plane through the origin that is parallel to the plane $4 x-2 y+7 z+12=0$.
