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Problems 1 - Calculus II

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1. Find the intersection of the lines $\langle 2,1,0\rangle + t\langle -1,-1,-1\rangle$ and $\langle 3,0,5\rangle + t\langle 2,0,6\rangle$.
2. Find the equation of the plane that contains the point $(1,3,0)$ and the line given by $x = 3 + 2t, y = -4t, z = 7 - t$.
3. Find the equation of the plane through the points $A = (1,3,2)$, $B = (5,2,0)$ and $C = (3,-1,6)$.
4. Find the intersection, if any, of the line $x = 2 + 3t, y = -4t, z = 5 + t$ and the plane $4x + 5y - 2z = 18$.
5. Given two planes $\pi_1 : x + y + z = 1$ and $\pi_2 : x - 2y + 3z = 1$, find the line of intersection.
6. Sketch each of the quadric surface $y^2 = 4x^2 + 16z^2$.
7. Sketch the quadric surface: $z = \dfrac{x^2}{4} + \dfrac{y^2}{4} - 6$.
8. Compute the volume of the parallelepiped formed by three vectors $\vec{u} = \langle 1,2,4\rangle$, $\vec{v} = \langle -5,3,-7\rangle$, $\vec{w} = \langle -1,4,2\rangle$.
9. Convert the coordinates $(-2,2,3)$ from Cartesian to cylindrical.
10. Convert the coordinates $(2\sqrt{3},6,-4)$ from Cartesian to spherical.
11. Convert the coordinates $(1,\dfrac{\pi}{2},1)$ from cylindrical to spherical.
12. Change the equation $x^2 + y^2 - z^2 = 1$ to spherical coordinates.
13. If A, B and C are three points, find $\overrightarrow{AB} + \overrightarrow{BC} + \overrightarrow{CA}$.

14. Find the angle between the vectors $\vec{u} = \langle 3,3,0 \rangle$ and $\vec{v} = \langle 1,0,0 \rangle$.

15. Let $\vec{u} = \langle 1,1,0 \rangle$ and $\vec{v} = \langle 2,4,2 \rangle$. Find a unit vector that is perpendicular to both $\vec{u}$ and $\vec{v}$.

16. Find the area of the parallelogram with vertices $(0,0), (1,2), (3,7)$ and $(2,5)$.

17. Find the distance from $(2, -1, -1)$ to the plane $2x - 3y + z = 2$.

18. Find the distance from $(1,0,1)$ to the line $\langle 3,2,1 \rangle + t\langle 2, -1, -2 \rangle$.

19. Find an equation for the sphere with radius 1 and center at $(0,1,0)$ in spherical coordinates.

20. Find the cosine of the angle between the planes $x + y + z = 2$ and $x + 2y + 3z = 8$.