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MAC 2313.9728
Cyr

Quiz 1
You must show all work to receive full credit!!

Problem 1. (2 points) A sled is pulled along a level path through snow by a rope. A 30 N force acting at an angle 60° above the horizontal moves the sled 80 meters. Find the work done by the force.

\[ W = \mathbf{F} \cdot \mathbf{d} = |\mathbf{F}| |\mathbf{d}| \cos \theta \]
\[ = (30 \text{ N}) (80 \text{ m}) \cos (60°) \]
\[ = 2400 \text{ J} = 1200 \text{ N} \cdot \text{m} \]

Problem 2. (2 points) Find parametric equations for the line passing through the point (2, 2, 4) and parallel to the vector \( \mathbf{v} = \langle 3, 2, -1 \rangle \).

\[ \mathbf{r}(t) = \mathbf{x}_0 + t \mathbf{v} = \langle 2, 2, 4 \rangle + t \langle 3, 2, -1 \rangle \]
\[ \Rightarrow \begin{cases} x(t) = 2 + 3t \\ y(t) = 2 + 2t \\ z(t) = 4 - t \end{cases} \]

Problem 3. (6 points) Find the equation of the plane passing through the point (1, 5, 1) and perpendicular to the planes \( 2x + y - 2z = 2 \) and \( x + 3z = 4 \).

The normal vector for the plane is perpendicular to the normal vectors of the other planes, so take their cross product: \[ \mathbf{n}_1 = \langle 2, 1, -2 \rangle, \mathbf{n}_2 = \langle 1, 0, 3 \rangle \]
\[ \mathbf{n} = \begin{vmatrix} \mathbf{i} & \mathbf{j} & \mathbf{k} \\ 2 & 1 & -2 \\ 1 & 0 & 3 \end{vmatrix} = \langle 3 - 0, -(6 + 2), 0 - 1 \rangle = \langle 3, -8, -1 \rangle \]

Plane equation is \[ \mathbf{n} \cdot \langle x, y, z \rangle = \mathbf{n} \cdot \langle x_0, y_0, z_0 \rangle = \langle 3, -8, -1 \rangle \cdot \langle 1, 5, 1 \rangle \]
\[ = 3 - 40 - 1 = -38 \]

\[ 3x - 8y - 2 = -38 \]