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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  $60^\circ$  above the horizontal moves the sled 80 meters. Find the work done by the force.

$$\begin{aligned} W &= \hat{F} \cdot \hat{d} = |\hat{F}| |\hat{d}| \cos \theta \\ &= (30)(80) \cos(60^\circ) \\ &= 2400 \left(\frac{1}{2}\right) = \boxed{1200 \text{ N}\cdot\text{m}} \end{aligned}$$

**Problem 2.** (2 points) Find parametric equations for the line passing through the point  $(2, 2, 4)$  and parallel to the vector  $\langle 3, 2, -1 \rangle$ .

$$\hat{r}(t) = \hat{x}_0 + t\hat{v} = \langle 2, 2, 4 \rangle + t\langle 3, 2, -1 \rangle$$

$$\Rightarrow \begin{cases} x(t) = 2 + 3t \\ y(t) = 2 + 2t \\ z(t) = 4 - t \end{cases}$$

**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:  $\hat{n}_1 = \langle 2, 1, -2 \rangle$ ,  $\hat{n}_2 = \langle 1, 0, 3 \rangle$

$$\hat{n} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 2 & 1 & -2 \\ 1 & 0 & 3 \end{vmatrix} = \langle 3-0, -(6+2), 0-1 \rangle = \langle 3, -8, -1 \rangle$$

$$\begin{aligned} \text{Plane equation is } \hat{n} \cdot \langle x, y, z \rangle &= \hat{n} \cdot \langle x_0, y_0, z_0 \rangle = \langle 3, -8, -1 \rangle \cdot \langle 1, 5, 1 \rangle \\ &= 3 - 40 - 1 = -38 \end{aligned}$$

$$\Rightarrow \boxed{3x - 8y - z = -38}$$