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Quiz 2
You must show all work to receive full credit!!

Problem 1. (2 pts) If $\mathbf{v} \times \mathbf{w} = \langle 4, -2, 5 \rangle$, find $\mathbf{w} \times (\mathbf{v} + \mathbf{w})$.

$$\vec{w} \times (\vec{v} + \vec{w}) = (\vec{w} \times \vec{v}) + (\vec{w} \times \vec{w}) = -(\vec{v} \times \vec{w}) + \vec{0}$$
$$= -\langle 4, -2, 5 \rangle$$
$$= \boxed{\langle -4, 2, -5 \rangle}$$

Problem 2. (4 pts) Find the scalar equation of the plane containing the vectors $\langle 1, -5, 3 \rangle$ and $\langle 2, 7, -4 \rangle$ and passing through the point $(-2, 8, 3)$.

$$\vec{n} = \langle 1, -5, 3 \rangle \times \langle 2, 7, -4 \rangle = \begin{vmatrix} \hat{\imath} & \hat{\jmath} & \hat{k} \\ 1 & -5 & 3 \\ 2 & 7 & -4 \end{vmatrix} = (20-21)\hat{\imath} - (-4-6)\hat{\jmath} + (7-(-10))\hat{k}$$
$$= \langle -1, 10, 17 \rangle$$

$$\langle x+2, y-8, z-3 \rangle \cdot \langle -1, 10, 17 \rangle = 0$$
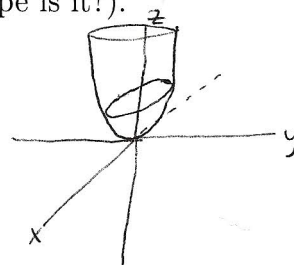$$-x - 2 + 10y - 80 + 17z - 51 = 0$$
$$\boxed{-x + 10y + 17z = 133}$$

Problem 3. (4 pts) A quadric surface is given by the equation $z = \left(\dfrac{x}{4}\right)^2 + \left(\dfrac{y}{3}\right)^2$. Find the traces obtained by intersecting the surface with the planes $z = 1$, $y = 0$, and $x = 0$, and use this information to classify the quadric surface (what type is it?).

$z = 1 \Rightarrow \left(\frac{x}{4}\right)^2 + \left(\frac{y}{3}\right)^2 = 1$ (ellipse)

$y = 0 \Rightarrow z = \left(\frac{x}{4}\right)^2$ (parabola)

$x = 0 \Rightarrow z = \left(\frac{y}{3}\right)^2$ (parabola)

Horizontal traces are ellipses, vertical traces are (upward) parabolas, so surface is an $\boxed{\text{elliptic paraboloid}}$.

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