

MATH 243-012 — Lecture Quiz 2: Problem Sheet

1. Consider $\mathbf{u} = \langle -5, 0, 4 \rangle$ and $\mathbf{v} = \langle 2, -4, 4 \rangle$.

(a) *Determine whether \mathbf{u} and \mathbf{v} are perpendicular. Justify.*

(b) *Find $\text{proj}_{\mathbf{v}} \mathbf{u}$.*

2. *Find parametric equations of the line through $A(5, 2, 3)$ and $B(4, -2, -3)$.*

3. *(True/False) The planes $2x + 4y - 3z + 4 = 0$ and $2x + 3y = -5z - 5$ are parallel.*

4. *Find an equation of the plane through $P(1, 2, 3)$ that contains the line*

$$\frac{x+1}{2} = \frac{y-2}{3}, \quad z = 3.$$

5. Which equation matches the pictured surface?

A. $\frac{z^2}{9} = \frac{x^2}{4} + y^2 \rightarrow$ double cone (opens in $\pm z$).

B. $z = \frac{x^2}{4} + y^2 \rightarrow$ elliptic paraboloid (upward bowl).

C. $z = \frac{x^2}{4} - y^2 \rightarrow$ hyperbolic paraboloid (saddle).

D. $\frac{z^2}{9} = \frac{x^2}{4} - y^2 \rightarrow$ hyperbolic cone (ruled; hyperbolic cross-sections).