

Math130 Trigonometry

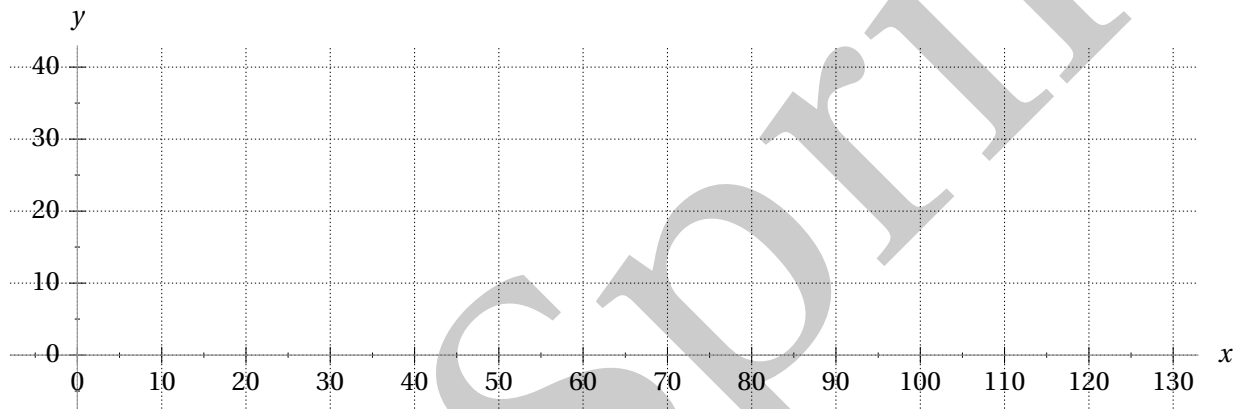
Fourth Midterm Exam

Colorado Mesa University · 2025 Spring

NAME: _____

1. Consider the vectors $\mathbf{u} = \langle 35, 4 \rangle$ and $\mathbf{v} = \langle 45, 28 \rangle$ in the xy -plane with the origin as their initial point.

(a) On these coordinate axes sketch the vectors $\mathbf{u}$ and $\mathbf{v}$ and $2\mathbf{u} + \mathbf{v}$.



(b) Calculate $\hat{\mathbf{v}}$, the unit vector in the direction of $\mathbf{v}$.

(c) Calculate $\text{proj}_{\mathbf{v}}(\mathbf{u})$, the projection of $\mathbf{u}$ onto $\mathbf{v}$, and sketch it on the coordinate axes above.

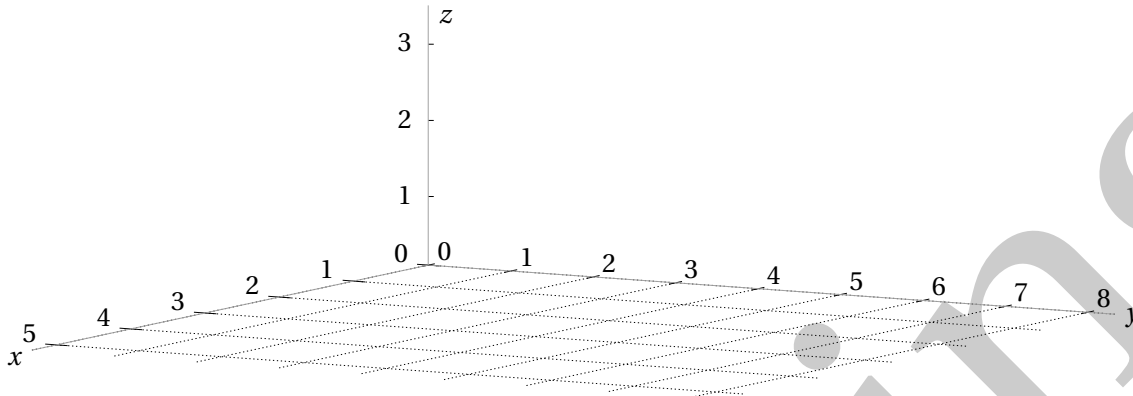
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(d) Calculate the measure of the angle between u and v .

(e) Calculate the distance between the terminal points of u and v .

(f) Calculate the area of the triangle framed by u and v .

2. Consider the three points $P = (1, 2, 3)$ and $Q = (3, 0, 2)$ and $R = (1, 7, 0)$ in xyz -space.



- (a) Determine the coordinates of the point on the line segment with endpoints P and Q that is equally distant to those two points.
- (b) Determine a parametric vector equation for the line that contains the points P and Q . Express the equation in the form $\mathbf{r}(t) = \mathbf{v}t + \mathbf{P}$ for some direction vector $\mathbf{v}$.
- (c) Determine the coordinates of the point at which the line that contains the points P and Q intersects the xy -plane.

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- (d) Determine an equation for the plane that contains the points P and Q and R . Express the equation in the form $Ax + By + Cz = D$ for whole numbers A and B and C and D .

- (e) Calculate the shortest distance from the origin $(0,0,0)$ to the plane that contains P and Q and R .

- (f) Calculate the area of the triangle with vertices P and Q and R .