TEXAS A&M UNIVERSITY
Math Learning Center

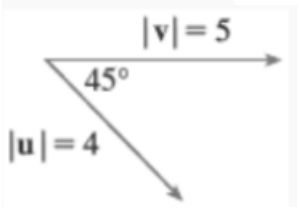
Math 251 – Fall 2021
Week In Review

Wir 2: 12.4, 12.5, 12.6

Section 12.4

1. Find the cross product of $\langle 1, 1, 3\rangle$ and $\langle -2, -1, 5\rangle$ and find the area of the parallelogram determined by the two vectors.

2. Find $|\mathbf{u} \times \mathbf{v}|$ and determine if $\mathbf{u} \times \mathbf{v}$ points in or out of the page.



3. Find two unit vectors that are orthogonal to the plane that passes through the points $P(1, 0, 1)$, $Q(2, 3, 4)$ and $R(2, 1, 1)$.

4. Determine whether each expression is meaningful or meaningless (circle one). If so, state whether the expression is a vector or a scalar.

a.) $\mathbf{a} \cdot \mathbf{b}$	meaningful (vector or scalar)	meaningless
b.) $\mathbf{a} \times \mathbf{b}$	meaningful (vector or scalar)	meaningless
c.) $\mathbf{a} \cdot (\mathbf{b} \times \mathbf{c})$	meaningful (vector or scalar)	meaningless
d.) $\mathbf{a} \times (\mathbf{b} \times \mathbf{c})$	meaningful (vector or scalar)	meaningless
e.) $(\mathbf{a} \cdot \mathbf{b}) \times (\mathbf{c} \cdot \mathbf{d})$	meaningful (vector or scalar)	meaningless
f.) $(\mathbf{a} \times \mathbf{b}) \cdot (\mathbf{c} \times \mathbf{d})$	meaningful (vector or scalar)	meaningless
g.) $\mathbf{a} \times (\mathbf{b} \cdot \mathbf{c})$	meaningful (vector or scalar)	meaningless
h.) $\lvert\mathbf{a}\rvert(\mathbf{b} \times \mathbf{c})$	meaningful (vector or scalar)	meaningless

Section 12.5

1. Find vector, parametric, and symmetric equations for the line through the point $(1, 0, -3)$ and parallel to the vector $2\,\boldsymbol{i} - 4\,\boldsymbol{j} + 5\,\boldsymbol{k}$.

Thanks to Amy Austin for generously sharing all of her WIR problems from last semester.

2. Find parametric and symmetric equations of the line through the points (1, 2, 0) and (-5, 4, 2).

3. Find parametric and symmetric equations of the line passing through the point (-3, 5, 4) and parallel to the line $x = 1 + 3t, y = -1 - 2t, z = 3 + t$.

4. Find an equation of the plane through the point $(-4, 3, 1)$ that is perpendicular to the vector $\boldsymbol{a} = -4\,\boldsymbol{i} + 7\,\boldsymbol{j} - 2\,\boldsymbol{k}$.

5. Find an equation of the plane passing through the points (1, 2, -3), (2, 3, 1), and (0, -2, -1).

6. Determine whether the planes $3x + y - 4z = 3$ and $-9x - 3y + 12z = 4$ are orthogonal, parallel, or neither. Find the angle of intersection and the set of parametric equations for the line of intersection of the planes.

7. Determine whether the planes $x - 3y + 6z = 4$ and $5x + y - z = 4$ are orthogonal, parallel, or neither. Find the angle of intersection and the set of parametric equations for the line of intersection of the planes.

8. Find the point where the line $x = 1 + t, y = 2t$, and $z = -3t$ intersects the plane with equation $-4x + 2y - 4z = -2$.

9. Find the distance between point (1, 2, 3) and the plane with equation $2x - y + z = 4$.

Section 12.6

1. Identify and sketch the following quadric surfaces:

a) $z = (x + 4)^2 + (y - 2)^2 + 5.$

b) $z = -(x^2 + y^2)$

Thanks to Amy Austin for generously sharing all of her WIR problems from last semester.

c) $y^2 = x^2 + z^2$

d) $x^2 + y^2 + z - 4x - 6y + 13 = 0.$

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