MULTIVARIABLE CALCULUS   MATH 2D

Midterm Exam I with answers

Problem 1.

Determine whether the given vectors are orthogonal, parallel, or neither.

a) $< 2, 1, 3 >$ and $< 0, -3, 1 >$

b) $< 3, \sqrt{3}, 2 >$ and $< -1, -\frac{1}{\sqrt{3}}, -\frac{2}{3} >$

c) $< 2, 5, 3 >$ and $< -1, 5, 1 >$

Answers:

a) orthogonal;

b) parallel;

c) neither.

Problem 2.

Calculate the given quantity if

$$\bar{v} =< 2, 1, 3 >, \bar{u} =< 2, 1, 0 >, \bar{w} =< -2, 1, -1 >$$

a) $2\bar{v} + 2\bar{u} - \bar{w}$

b) $|\bar{v} \times \bar{u}|$

c) $\bar{v} \cdot (\bar{u} \times \bar{w})$

Answers:

a) $< 10, 3, 7 >$

b) $\sqrt{45}$

c) 12

Problem 3.

Find the equation of the plane through $(2, 1, 3)$ that contains the line

$$x = t + 2, \; y = 2t - 3, \; z = -t + 1$$

Answer: $4x - y + 2z = 13$

Problem 4.

Find the distance from the origin to the line

$$x = 2t + 1, \ y = t - 1, \ z = t - 5$$

Answer: $\sqrt{\frac{73}{3}}$

Problem 5.

Reduce the equation to one of the standard forms, classify the surface:

$$x^2 + 2y^2 - 2x - 4y - z - 15 = 0$$

Answer: $\frac{(x-1)^2}{a^2} + \frac{(y+1)^2}{b^2} = (z + 14)$, where $a^2 = 1, b^2 = 1/2$. It is an elliptic paraboloid.