Physics 51 Proficiency Test 4.sample (Time: 15 minutes) 25 points

By Todd Sauke

Name ________________________ Section # ________

We have seen that vector quantities can be added to and subtracted from one another. Vector quantities can also be multiplied together. We study two fundamental types of vector products in the Physics 50 series, the scalar (or "dot") product and the vector (or "cross") product. The dot product of two vectors ("**a • b**") has a scalar result. The cross product of two vectors ("**a x b**") has a vector result, with the resultant vector perpendicular to the plane containing the source vectors. By convention, the cross product relies on a "right hand rule" to establish the resultant direction.

What is the dot product of the vectors **a** and **b** if the magnitude of **a** is 11, the magnitude of **b** is 5, and the angle between them is 64º?

a • b = ________________

For what value of angle between **a** and **b** would the dot product be maximized? (circle one below)

0º 45º 90º 135º 180º

The components of vectors **g** and **h** are as follows:

g_x = 3	h_x = 5
g_y = 0	h_y = -3
g_z = -3	h_z = 4

What is the dot product of **g** and **h**?

g • h = ________________

(over)

Vector **m**, of length 6, lies in the plane of this paper, pointing to the right. Vector **n**, also in the plane of this paper, has length 4 and makes an angle of 105º (counter clockwise) to **m**. Sketch the vectors **m** and **n** below.

What is the magnitude of the cross product of the vectors **m** and **n**?

| **m x n** | = ____________________

What is the direction of this cross product? (circle one below)

out of the paper (toward you) into the paper in the plane of the paper

For what value of angle between **m** and **n** would the magnitude of the cross product be maximized? (circle one below)

0º 45º 90º 135º 180º

The components of vectors **q** and **r** are as follows:

q_x = 3	r_x = -2
q_y = 0	r_y = 4
q_z = 0	r_z = 0

What is the cross product (**s**) of **q** and **r**? (**s** ≡ **q x r**)
(Express your answer in terms of the components of the vector.)

s_x = ______________

s_y = ______________

s_z = ______________