**Pre Calc BC 4 - D Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

*NOTE: Assume that points are given with coordinates (x, y, z, w).*

1. In 4-D, the equation *x* = 2 is the equation of a …

 a) line b) plane c) space d) hyper-space

2. Given the two points P(1, 2, -1, 3) and Q(4, 6, 4, 2)

a) Find the length of 

b) Find the midpoint of 

c) Write a parametric equation for the line containing 

d) Find the angle formed by  and , where R is the point (-2, 3, 0, 1)

3. Find the equation of the 3-D *space* defined by (1, 4, 0, -8); (2, -2, -3, 4);

 (2, 0, 3, -8); and (4, -2, -3, -4). *Hint: matrices.*

4. a) Write the equation of a “4-sphere” centered at (1, -3, 0, 2) and with a radius of 13.

 b) Demonstrate that the point P(5, -3, 12, -1) is on this sphere.

 c) Find the other endpoint of the diameter with endpoint P.

 d) What is the intersection of the 4-sphere with the *space* *z* = 0?

5. What is this: ? Describe the 3-D “traces” as fully as possible.

6. In the fourth dimension one rotates around a plane and reflects through a space. Given the point P(3, 4, 5, 6), find the image of P for each of these and write a generalized matrix:

 a) 

 b) 

 c) If an object is reflected through the origin is its orientation reversed?