Math 120 QR

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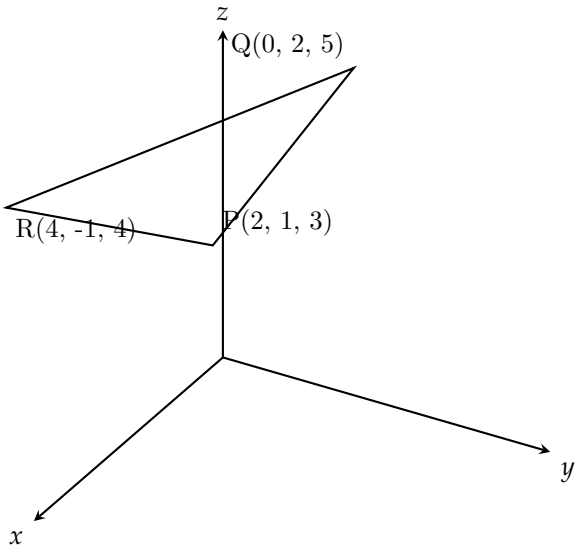
Contents

Chapter 1

1.1 PSet 1

Question 1

Find the lengths of the sides of the triangle with vertices P (2, 1, 3), Q(0, 2, 5) and R(4, -1, 4). Is the triangle an acute triangle (all sides less than 90°), a right triangle, or an obtuse triangle (one angle greater than 90°)



Solution: Image:

$$\overrightarrow{PQ} = \langle 0-2, 2-1, 5-3\rangle = \langle -2, 1, 2\rangle$$

$$\overrightarrow{QR} = \langle 4-0, -1-2, 4-5\rangle = \langle 4, -3, -1\rangle$$

$$\overrightarrow{RP} = \langle 2-4, 1--1, 3-4\rangle = \langle -2, -2, 1\rangle$$

$$|\overrightarrow{PQ}| = \sqrt{(-2)^2 + 1^2 + (-2)^2} = \sqrt{9} = 3$$

$$|\overrightarrow{QR}| = \sqrt{(4)^2 + (-3)^2 + (1)^2} = \sqrt{26}$$

$$|\overrightarrow{RP}| = \sqrt{(-2)^2 + (-2)^2 + (1)^2} = \sqrt{9} = 3$$

angles:

$$|\overrightarrow{PQ}|^2 = 26 = 9 + 9 - 2(3)(3)\cos\theta$$

$$8 = -18\cos\theta$$
$$\frac{8}{18} = -\cos(\theta)$$
$$\theta = \arccos\left(-\frac{8}{18}\right) \approx 116$$

Trianlge is obtuse

Question 2

Find the equation of the sphere for which the line segment between the points $A(1,1,1)$ and $B(3,-7,3)$ is a diameter. (This means that that A and B are antipodal points on the sphere.)

Solution:
diameter:

$$\sqrt{(3-1)^2+(-7-1)^2+(3-1)^2} = 6\sqrt{2}$$