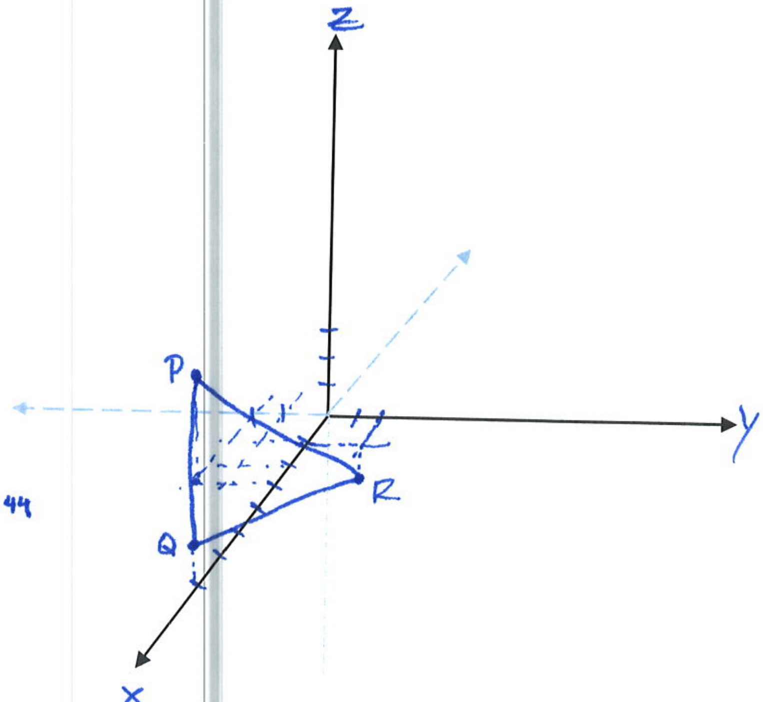
MAT 201, Quiz #1, Spring 2016 Name KEY

Instructions: Show all work. Answers without work required to obtain the solution will not receive full credit. Some questions may contain multiple parts: be sure to answer all of them. Give exact answers unless specifically asked to estimate.

1. Plot the points $P(3,-2,3), Q(7,0,1), R(1,2,-1)$ on the graph below. Label the axes appropriately using the right-hand rule.



2. The points in #1 form a triangle. Find the length of each side and determine if the triangle is a right triangle. NO

$\|\vec{PQ}\| = \|\langle -4,-2,2\rangle\| = \sqrt{16+4+4} = \sqrt{24} = 2\sqrt{6}$

$\|\vec{QR}\| = \|\langle 6,-2,2\rangle\| = \sqrt{36+4+4} = \sqrt{44} = 2\sqrt{11}$ long

$\|\vec{PR}\| = \|\langle 2,-4,4\rangle\| = \sqrt{4+16+16} = \sqrt{36} = 6$

$36+4 \neq 44$

3. Find the midpoint of the side $\overrightarrow{QR}$.

$\left(\frac{7+1}{2}, \frac{0+2}{2}, \frac{1-1}{2}\right) = (4,1,0)$

4. Describe in words what the graph of $y^2 + z^2 = 16$ looks like (including its orientation in space).

circular Cylinder wrapped around the x-axis of radius 4

5. Consider the vector $\hat{\imath} + \sqrt{3}\hat{\jmath}$.
   a. Find its length. $\sqrt{1^2+(\sqrt{3})^2} = \sqrt{4} = 2$
   b. Find a unit vector in the same direction. $\frac{1}{2}\hat{\imath} + \frac{\sqrt{3}}{2}\hat{\jmath}$
   c. Write the vector in polar form.

   $2\left(\cos\frac{\pi}{3}\hat{\imath} + \sin\frac{\pi}{3}\hat{\jmath}\right)$

6. Find the angle between the vectors $\langle 3,-1,5\rangle$ and $\hat{\imath} + 2\hat{\jmath} - 2\hat{k}$.

$\cos\theta = \frac{3-2-10}{\sqrt{9+1+25}\sqrt{1+4+4}} = \frac{-9}{\sqrt{35}\sqrt{9}} = \frac{-3}{\sqrt{35}}$ $\quad \theta = \cos^{-1}\left(\frac{-3}{\sqrt{35}}\right) \approx 120.4°$ or 2.1026 radians

7. For the matrices $A = \begin{bmatrix} 1 & 2 \\ -1 & 3 \end{bmatrix}, B = \begin{bmatrix} 4 & 0 \\ 1 & -2 \end{bmatrix}$ find the following:
   a. $A + B$ $\begin{bmatrix} 5 & 2 \\ 0 & 1 \end{bmatrix}$
   b. AB

   $\begin{bmatrix} 4+2 & 0-4 \\ -4+3 & 0-6 \end{bmatrix} = \begin{bmatrix} 6 & -4 \\ -1 & -6 \end{bmatrix}$