MAT 201, Quiz #1, Fall 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. Describe the region in R^3 defined by each equation.
   a. $y^2 + z^2 = 16$ Circular cylinder wrapped around x-axis

   b. $z = x$ plane through y-axis

2. For the vectors $\vec{a} = \langle 8, -1, 4 \rangle, \vec{b} = -4\hat{\imath} + 2\hat{\jmath} + 4\hat{k}$, find:
   a. $\vec{a} + \vec{b}$ $\langle 4, 1, 8 \rangle$

   b. $\|\vec{a}\|$ $\sqrt{64 + 1 + 16} = \sqrt{81} = 9$

   c. The distance between $\vec{a}$ and $\vec{b}$

   $\langle -12, 3, 0 \rangle$

   $\sqrt{144 + 9} = \sqrt{153}$

   d. A unit vector in the direction of $\vec{b}$

   $\|\vec{b}\| = \sqrt{16 + 4 + 16} = \sqrt{36} = 6$

   $\hat{b} = \left\langle \frac{-4}{6}, \frac{2}{6}, \frac{4}{6} \right\rangle = \left\langle -\frac{2}{3}, \frac{1}{3}, \frac{2}{3} \right\rangle$

   e. $\vec{a} \cdot \vec{b}$

   $-32 - 2 + 16 = -18$

   f. The angle between $\vec{a}$ and $\vec{b}$ in radians

   $\cos\theta = \frac{-18}{9 \cdot 6} = -\frac{1}{3}$ $\theta = 1.91$ radians