Math 283 Quiz 1 section 5: Sep 5

Name: SATOKO

Correct methods will receive partial credits.

1. Answer the following questions regarding the graph of the equation $x + y = 3$ in three dimensional space.

   (a) Name a point on the surface $x + y = 3$.
   
   \[
   z \text{ can be any value, } x = 3 - y, \text{ so } (4, 1, 2) \]

   (b) Name a point on the surface $x + y = 3$ and on the $xz$-plane.
   
   \[
   \text{must have } y = 0 \quad \Rightarrow \quad x = 3 \quad \Rightarrow \quad (3, 0, 2) \]

   (c) Find the distance between the two points you listed in parts (a) and (b).
   
   \[
   D = \sqrt{(4-3)^2 + (1-0)^2 + (2-2)^2} = \sqrt{2} \]

2. If a two dimensional vector $v$ lies in the second quadrant, making an angle $\pi/4$ with the negative $x$-axis and $|v| = 2$, find $v$ in its component form.

   $v = 2 \cos \left( \frac{3\pi}{4} \right) \hat{i} + 2 \sin \left( \frac{3\pi}{4} \right) \hat{j} = \sqrt{2} \hat{i} + \sqrt{2} \hat{j}$

3. Consider $a = (-1, 2, -1)$ and $b = (2, 0, 1)$.

   (a) Find the dot product $a \cdot b$.
   
   \[
   \overrightarrow{a} \cdot \overrightarrow{b} = -2 + 0 - 1 = -3 \]

   (b) Circle your answers: Because the dot product in part (a) is positive/negative, the angle between $a$ and $b$ is acute (between 0 and 90 degrees)/obtuse (between 90 and 180 degrees). You do not need to find the angle.

   \[
   \cos \theta > 0 \quad \text{for} \quad 0 < \theta < \frac{\pi}{2} \\
   \cos \theta < 0 \quad \text{for} \quad \frac{\pi}{2} < \theta < \pi
   \]