

Math 3113 - Multivariable Calculus

Homework #1 - 2006.01.18

Due Date - 2006.01.25

Name: _____

1. Given two points $P_1(x_1, y_1, z_1)$ and $P_2(x_2, y_2, z_2)$, show that the point M defined as below is equidistant from P_1 and P_2 .

$$M \left(\frac{1}{2}(x_1 + x_2), \frac{1}{2}(y_1 + y_2), \frac{1}{2}(z_1 + z_2) \right).$$

2. Using the definitions of P_1 , P_2 and M as in the previous problem, compute $\overrightarrow{P_1M}$ and $\overrightarrow{P_1P_2}$.

3. Remember that $\overrightarrow{P_1M} \cdot \overrightarrow{P_1P_2} = \left| \overrightarrow{P_1M} \right| \left| \overrightarrow{P_1P_2} \right| \cos(\theta)$. What is θ in this case?

4. Using the above three problems, show that the point M is the midpoint on the line segment connecting the points P_1 and P_2 .

5. Suppose that M , P_1 and P_2 are defined as previous. Let $A(a_1, a_2, a_3)$ be any other point in \mathbb{R}^3 . Show that $\overrightarrow{AM} = \frac{1}{2}(\overrightarrow{AP_1} + \overrightarrow{AP_2})$.