

MA 213 Worksheet #5

Section 12.5

1/24/19

1 12.5.1 Determine whether each statement is true or false in 3D space. If true, explain why. If false, give a counterexample.

- (a) Two planes parallel to a third plane are parallel.
- (b) Two planes perpendicular to a third plane are parallel.
- (c) Two lines parallel to a plane are parallel.
- (d) Two lines perpendicular to a plane are parallel.
- (e) Two planes perpendicular to a line are parallel.
- (f) A plane and a line either intersect or are parallel.

2 12.5.3 Find a vector equation and the parametric equations of the line through the point $(2, 2.4, 3.5)$ and parallel to the vector $3\mathbf{i} - 2\mathbf{j} - \mathbf{k}$.

3 12.5.31 Find an equation of the plane through points $(0, 1, 1)$, $(1, 0, 1)$, and $(1, 1, 0)$.

4 Determine whether the lines L_1 and L_2 are parallel, skew, or intersecting. If they intersect, find the point of intersection.

(a) 12.5.19

$$L_1 : x = 3 + 2t, y = 4 - t, z = 1 + 3t$$

$$L_2 : x = 1 + 4s, y = 3 - 2s, z = 4 + 5s$$

(b) 12.5.21

$$L_1 : \frac{x-2}{1} = \frac{y-3}{-2} = \frac{z-1}{-3}$$

$$L_2 : \frac{x-3}{1} = \frac{y+4}{3} = \frac{z-2}{-7}$$

5 12.5.30 Find an equation of the plane that contains the line $\langle x, y, z \rangle = \langle 1 + t, 2 - t, 4 - 3t \rangle$ and is parallel to the plane $5x + 2y + z = 1$.

6 12.5.49 Find direction numbers for the line of intersection of the planes $x + y + z = 1$ and $x + z = 0$.

7 12.5.61 Find an equation of the plane consisting of all the points that are equidistant from the points $(1, 0, -2)$ and $(3, 4, 0)$.

8 Assume that three points $P, Q,$ and R are not collinear. Explain why the distance d between P and the line through Q and R is given by

$$d = \frac{\|\overrightarrow{QR} \times \overrightarrow{QP}\|}{\|\overrightarrow{QR}\|}.$$