# MA 213 Worksheet #5

Section 12.5
9/6/18

**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 two 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

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