# Math 1210 Tutorial 9

**1.** Evaluate the following determinants. Simplify the second answer as much as possible.

(a) $\begin{vmatrix} 2 & 1 & -3 & 0 \\ 4 & 2 & 1 & 5 \\ -3 & 3 & -2 & 2 \\ 4 & 5 & 2 & -4 \end{vmatrix}$

(b) $\begin{vmatrix} x & x^2 & x^3 \\ y & y^2 & y^3 \\ z & z^2 & z^3 \end{vmatrix}$

**2.** Use Cramer's rule, if possible, to find the value of $z$ satisfying the equations

$$x + 2y - 3z + 6w = 0,$$
$$2x - y + w = 0,$$
$$5y + z - 2w = 0,$$
$$x + y + z + w = 0.$$

**3.** Use Cramer's rule, if possible, to find the value of $z$ satisfying the equations

$$x + y - 3z = 5,$$
$$2x + 2y - w = 0,$$
$$3x - 2y + z = 1,$$
$$3y + 2z - w = 0.$$

**4.** (a) Determine whether the vectors

$$\mathbf{u} = \langle 2, 1, -3, 0 \rangle, \quad \mathbf{v} = \langle 5, -1, 2, 3 \rangle, \quad \mathbf{w} = \langle 0, 3, 2, -4 \rangle$$

are linearly dependent or linearly independent.

**Answers:**

**1.** (a) 891    (b) $xyz(x - y)(y - z)(z - x)$

**2.** $z = 0$

**3.** $z = 4/5$

**4.** Linearly independent