Problems for M 10/5:

3.3.1 Use Cramer’s rule to solve $5x_1 + 7x_2 = 3$, $2x_1 + 4x_2 = 1$.

3.3.7 Determine the values of $s$ for which the system has a unique solution, and describe the solution:

\[
\begin{align*}
6sx_1 + 4x_2 &= 5 \\
9x_1 + 2sx_2 &= -2.
\end{align*}
\]

3.3.11 Find the adjugate of the given matrix and use it to find the inverse:

\[
A = \begin{bmatrix} 0 & -2 & -1 \\ 5 & 0 & 0 \\ -1 & 1 & 1 \end{bmatrix}
\]

(We didn’t define the adjugate in class, though we got close: take a look at page 181.)

3.3.20 Find the area of the parallelogram with vertices $(0, 0)$, $(2, -4)$, $(4, -5)$, and $(2, -1)$.

3.3.29 Find a formula for the area of the triangle whose vertices are $0$, $v_1 = (a, b)$, and $v_2 = (c, d)$ in $\mathbb{R}^2$.

Problems for W 10/7:

4.1.1 Let $V$ be the first quadrant in the $xy$-plane, that is the set of all vectors $(x, y)$ with $x \geq 0$ and $y \geq 0$. In set notation, this is:

\[
V = \left\{ \begin{bmatrix} x \\ y \end{bmatrix} : x \geq 0, y \geq 0 \right\}.
\]

(a) If $u$ and $v$ are in $V$, is $u + v$ in $V$?

(b) Find a specific vector $u$ in $V$ and a specific scalar $c$ such that $cu$ is not in $V$. (This is enough to show that $V$ is not a vector space.)

4.1.3 Let $H$ be the set of points inside and on the unit circle in the $xy$-plane:

\[
H = \left\{ \begin{bmatrix} x \\ y \end{bmatrix} : x^2 + y^2 \leq 1 \right\}.
\]

Find a specific example – two vectors or a vector and a scalar – to show that $H$ is not a subspace of $\mathbb{R}^2$. 
4.1.5 Let $\mathbb{P}_2$ be the vector space of polynomials of degree at most 2. Is the set of polynomials of the form $at^2$ a subset of $\mathbb{P}_2$ (where $a$ is a scalar?)

4.1.7 Let $\mathbb{P}_2$ be the vector space of polynomials of degree at most 3. Is the set of all polynomials with integers as coefficients a subspace?

Problems for F 10/9:

4.1.11 Let $W$ be the set of all vectors of the form \[
\begin{bmatrix}
5b + 2c \\
b \\
c
\end{bmatrix}.
\] Find vectors $u$ and $v$ such that $W = \text{span}(u, v)$. Why does this show that $W$ is a subspace of $\mathbb{R}^n$?

4.2.4 Find an explicit description of the nullspace of the following matrix by listing a set of vectors that span the nullspace:
\[
A = \begin{bmatrix}
1 & -6 & 4 & 0 \\
0 & 0 & 2 & 0
\end{bmatrix}
\]

4.2.7 Explain why the following set either is or is not a vector space:
\[
\left\{ \begin{bmatrix} a \\ b \\ c \end{bmatrix} : a + b + c = 2 \right\}
\]

4.2.15 Find a matrix $A$ such that the given set is the column space of $A$.
\[
\left\{ \begin{bmatrix} 2s + 3t \\ r + s - 2t \\ 4r + s \\ 3r - s - t \end{bmatrix} : r, s, t \text{ are scalars} \right\}.
\]

4.2.17 For what value of $k$ is $\text{Nul}(A)$ a subspace of $\mathbb{R}^k$? For what value of $k$ is $\text{Col}(A)$ a subspace of $\mathbb{R}^k$?

\[
A = \begin{bmatrix}
2 & -6 \\
-1 & 3 \\
-4 & 12 \\
3 & -9
\end{bmatrix}.
\]