1. From the textbook: 1.4(b), 1.8(a), 2.1(a), 2.2(a)–(b), 2.3, 2.16, 3.3, 3.9, 3.12, 3.13. 4.2(c), 4.13 (d)–(e), 4.22(d) 5.2, 5.11, 5.18.

2. Let $\{\mathbf{v}_1, \mathbf{v}_2, \mathbf{v}_3, \mathbf{v}_4\}$ be a set of 4 vectors in $\mathbb{R}^n$. State the definition of the *span* of these vectors. Use this definition to prove that $\text{span}(\mathbf{v}_1, \mathbf{v}_2)$ is a subset of $\text{span}(\mathbf{v}_1, \mathbf{v}_2, \mathbf{v}_3, \mathbf{v}_4)$.

   Hint: To do this, write down what it means for a vector $\mathbf{v}$ to be an element of $\text{span}(\mathbf{v}_1, \mathbf{v}_2)$. Show that this vector $\mathbf{v}$ must also be an element of $\text{span}(\mathbf{v}_1, \mathbf{v}_2, \mathbf{v}_3, \mathbf{v}_4)$.

3. The graph of the function $y = \frac{1}{2}x + 1$ is a line in $\mathbb{R}^2$. Write down a parametric representation of this line.

4. Find a normal vector to the plane

$$P = \left\{ \begin{bmatrix} 2 \\ 0 \\ 1 \end{bmatrix} + s \begin{bmatrix} 1 \\ 0 \\ 1 \end{bmatrix} + t \begin{bmatrix} 1 \\ 1 \\ 2 \end{bmatrix} \mid s, t \in \mathbb{R} \right\}$$

   Hint: Cross-product.

5. (a) Suppose that P is a plane through the origin in $\mathbb{R}^3$, and that $\mathbf{n} = \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}$ is perpendicular to P. Write down an equation for the plane P.

   (b) Suppose that L is a line through the origin in $\mathbb{R}^3$, and that $\mathbf{n} = \begin{bmatrix} 1 \\ 0 \\ 1 \end{bmatrix}$ is perpendicular to L. What are the possibilities for the line L? Why does a perpendicular vector completely determine a plane in $\mathbb{R}^3$, but not a line?

6. Suppose I have a system of 4 linear equations in 3 variables. What are the possibilities for the number of solutions it has? Describe the possible solutions sets geometrically.