All problems are to be written up clearly and thoroughly, using complete sentences. This assignment is due in discussion at 2pm on Tuesday, January 21st.

For all T/F problems on the homework, provide a brief justification for your answer. That may be citing an appropriate theorem or providing a counterexample.

1. From the book:

   Section 5.1 problem 12.

   Section 5.2 problems 2 a, b, 3 f.

   Section 5.4 problems 1, 2 b, c, e, 8, 19.

2. Let $T : V \to V$ be a linear operator. We say that T is **nilpotent** if there exists k with $T^k = 0$.
   (a) Show that if T is nilpotent then it has precisely one eigenvalue.
   (b) Show that if T is nilpotent then $I_V - T$ is invertible. (*Hint:* Think about the power series expansion of $(1 - x)^{-1}$.)