

Prove the following propositions.

**Proposition 1.** For all  $n \in \mathbb{Z}$ ,  $n^2 + 2$  is not divisible by 4.

**Proposition 2.** There exists a real number  $L$  such that for every positive real number  $e$ , there exists a positive real number  $d$  such that if  $x$  is a real number with  $|x - 2| < d$ , then  $|7x - L| < e$ .

**Proposition 3.** For each  $n \geq 12$ , there are nonnegative integers  $a, b$  such that  $n = 3a + 7b$ .

**Writing Instructions:**

1. At the beginning of the proof, write your proof technique and the hypothesis (what is given or assumed).
2. Review the definitions of any relevant terms in the hypothesis and conclusion. For example, what does “ $m$  is divisible by  $n$ ” mean?
3. Once you have finished your proof, do not just turn in the mess. Make a final clean draft with a clear logical flow.
4. Assume your audience is one of your classmates who is familiar with the basic proof techniques, but has not done this assignment and needs a good deal of explanation. Do NOT assume the audience is the instructor.