CMSC 250 Homework 4 Spring 2010

Due Wednesday, March 24 at the beginning of your discussion section.

1. For each of the following, state either that the statement is true or that the statement is false. Then justify your answer.

   (a) The sum of any three consecutive integers is divisible by 3.
   (b) For all integers \( x \), \( x^2 + x \) is an even integer.
   (c) The product of any two distinct rational numbers is rational.
   (d) The product of any two distinct irrational numbers is irrational.
   (e) For any positive real number \( x > 3 \)
       \[ x^3 > 9x. \]
   (f) If the sum of two integers is odd, then (at least) one of those two integers is odd.
   (g) If the product of two integers is odd, then (at least) one of those two integers is odd.
   (h) For any positive real numbers \( a \) and \( b \)
       \[ \sqrt{a+b} < \sqrt{a} + \sqrt{b}. \]
   (i) \( \forall n \in \mathbb{Z}, n^2 - n > 0 \rightarrow n \neq 1 \)
   (j) If \( n \) is the sum of any four consecutive integers, \( n \equiv 2 \pmod{4} \).
   (k) For all integers \( n \), \( n \) is an even number if and only if \( 5n^2 + 12 \) is even.

2. Do Exercise 7 on page 347 of Epp.
