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ENG/20M

CSCE 531 Homework 2

1. Prove that if , then is even if and only if is even.

There are two pieces here. We must prove both of the following:

1. We’ll let and . To prove that , we’ll substitute for (because is even). Thus, , which is even, so we’ve proven .
2. Let and . Let’s show . This means is odd, so , which is odd. Thus, we’ve proven that , so we know that .

Because we’ve proven both and , we’ve shown that . Thus, if , then is even if and only if is even.

1. Show that for all , the product of at least one pair of the following is nonnegative:

For some arbitrary , each of the three equations can only evaluate to either a negative or a nonnegative value. Thus, for some , we can have one of four possible results:

1. three nonnegative values,
2. three negative values,
3. one nonnegative value and two negative values, or
4. one negative value and two nonnegative values.

These are the only four cases possible. We can see that, for each of the four cases, we will always have at least two negative values or at least two nonnegative values. Because the product of two negative numbers is positive, and because the product of two nonnegative numbers is nonnegative (we say *nonnegative* instead of *positive* because is a possible result for each equation), we are always able to find a nonnegative product pair for the three given equations. This concludes the proof.