Math 374
Practice Test 2

Prove or Disprove the following Statements:

1) The sum of two odd integers is even

2) The product of two irrational numbers is irrational.

3) The sum of a rational and an irrational is irrational.

4) Prove That $1 + 2^1 + 2^2 + 2^3 + \ldots + 2^n = 2^{n+1} - 1$

for all $n \geq 1$.

5) Prove That The following function correctly evaluates 2^n, by proving That $Q: \{ j = 2^i \}$ is a loop invariant, and evaluating The postcondition at loop termination.

```
Power (n):  (positive integer)
    i = 1
    j = 2
    while i ≠ n do
        j = j * 2
        i = i + 1
    end while
    return j
```

6) Give a recursive definition for all binary strings with an odd number of 0's.

7) Write the first 5 values of the sequence.

$M(1) = 2$

$M(2) = 2$

$M(n) = 2(M(n-1)) + M(n-2)$ for $n > 2$.

8) Find a closed formula, and prove it holds, for the following recurrence relation.

$$F(1) = 2,$$
$$F(n) = 2F(n-1) + 2^n \quad \text{for } n > 1.$$