Extra Credit

Proof Practice take 3

TCSS 321

Prove or disprove the following:

1. Whenever n is a positive integer, 3 divides $n^3 + 2n$.

2. Let n be a positive integer greater than or equal to two. If n people stand in a line with the first person in line a woman and the last person in line a man, then somewhere in the line there is a woman directly in front of a man.

3. Consider an arithmetic progression $a + (a + d) + (a + 2d) + ... + (a + nd)$. For all positive integers n we have, $\sum_{i=0}^{n}(a + id) = \frac{(n + 1)(2a + nd)}{2}$.

4. Suppose that $a_j \equiv b_j(\mod m)$ for $j = 1, 2, ...n$, then $\sum_{j=1}^{n} a_j \equiv \sum_{j=1}^{n} b_j(\mod m)$.

5. The algorithm to the right evaluates all strings of length n as "True" if they are palindromes and false otherwise.

```
def Recurse(x): #x is a list type
    if len(x)<2:
        return True
    else:
        if x[0]==x[len(x)-1]:
            del x[len(x)-1]
            del x[0]
            return Recurse(x)
        else:
            return False

x = [1,2,1]
Recurse(x)
 True

y=[1,2,3,4]
Recurse(y)
 False
```

6. Let n be a positive integer and x be a real number. There is no recursive algorithm that can compute x^n.

7. Let s be a string with n characters. There is no recursive algorithm that can reverse the characters in the string s.

8. 64 divides $3^{2n+2} + 56n + 55$ for every positive integers n.

9. For all positive integers, $a - b$ is a factor of $a^n - b^n$.

10. There is no recursive algorithm for computing the greatest common divisor of two positive integers.