**Midterm Exam 2**

**1.) (10) Show that if 5 divides 𝑛 with remainder 3, 10 divides with remainder 8**

Substitution

Simplification

Expand

Distribution

Divisible by 5 with a remainder of 8

**2. (15) Find GCD(184, 18), GCD(981, 243) and GCD(5655, 819).**

**a.)**

**b.)**

**c.)**

**3. (15) Find the remainders of and .**

**a.)** Exponentiation

Arithmetic and

Arithmetic and Modulo

**b.)** Exponentiation

Arithmetic and

Arithmetic

Modulo

**c.)**  Exponentiation

Arithmetic and

Exponentiation and Arithmetic

Arithmetic

Modulo

**4. (20) Prove by induction that**

Induction on n

Substitution

Arithmetic

Induction Hypothesis:

Induction Step:

Definition of Summation

Induction Hypothesis

Distribute

Simplify

Add like terms

Distribution

Distribution

Distribution

Distribution (left = right)

By induction

**5. (20) Prove by induction that for positive integers ,**

Induction on n

Substitution and Arithmetic

Induction Hypothesis:

Induction Step:

Arithmetic

Exponentiation

Induction Hypothesis

Exponentiation

Distribution

is divisible by 3 Distribution

By induction

**6. (20) Prove by induction that .**

Induction on n

Substitution

Arithmetic

Induction Hypothesis:

Induction Step:

Definition of Summation

Induction Hypothesis

Exponentiation

Arithmetic

Distribution

Arithmetic

Distribution

Exponentiation

Distribution

By induction