**ECS20**

**Homework 6**

**Exercise 1**

Prove or disprove each of these statements about the floor and ceiling functions.

a)  for all real numbers *x*.

b)  for all real numbers *x* and *y*.

c)  for all positive real numbers *x*.

**Exercise 2**

Show that *x3* is *O(x4)* but that *x4* is not *O(x3)*.

**Exercise 3**

1. Show that *2x-9* is *(x)*.
2. Show that *3x2 +x -5* is *(x2)*
3. Show that  is *(x)*
4. Show that *log10(x)* is *(log2(x))*

**Exercise 4**

Let *a* and *b* be two integers. Use a proof by contradiction to show that if *a2-b2+2ab* is odd then *a-b* is odd.

**Exercise 5**

Use a proof by contradiction to show that:

There exists a strictly positive real number *r* such that for all real number *x*, if then .

**Extra credit:**

We call a positive integer perfect if it equals the sum of its positive divisors other than itself.

1. Show that 6 and 28 are perfect
2. Show that *2p-1(2p-1)* is a perfect number when *2p-1* is prime.