CS 200 Recitation 4 Worksheet

Name:_____

Problems on this sheet are from *Discrete Mathematics and Its Applications*, by Rosen 6th ed. #4 is from *Data Abstraction and Problem Solving with Java, by Prichard.* Of course, there is not much work space here, I've got plenty of extra paper if you want it (recommended).

Problem 1: pp191, #11. Show that $3x^4 + 1$ is $O\left(\frac{x^4}{2}\right)$and that $\frac{x^4}{2}$ is $O(3x^4 + 1)$:

Hint for 2nd part: under what conditions is $\frac{x^4}{2} \leq 3x^4 + 1$?

Problem 2: pp191, #5. Show that $\frac{(x^2+1)}{(x+1)}$is $O(x)$:

Problem 3: pp199m #7. psudocode for evaluating polynomials $a_n x^n + a_{n-1}x^{n-1} + \ldots + a_1 x + a_0$at x = c is given:

```
procedure polynomial(c, a0, a1, ..., aN: are real numbers){
  power = 1;
  y = a0;
  for(i = 1 to N){
    power = power * c;
    y = y + ai * power //ai = ith a value
  }
  return y;
}
```

Exactly how many multiplications and additions are used to evaluate a polynomial of degree N at x = c? (do not count loop increments), Also can you express this in Big O notation?

Problem 4: Prichard pp 553 #1. How many comparisons of array items do the following loops contain? Can you express that in Big O notation?

```
int temp;
for(j = 1; j <= n-1; ++j){
  i = j + 1;
  do {
    if(theArray[i] < theArray[j]) {
      temp = theArray[i];
      theArray[i] = theArray[j];
      theArray[j] = temp;
    } //end if
  } while( i <=n );
} //end for
```