PCSS – Exercises on Algorithm Complexity

1. Find the asymptotic behavior of the following example functions:

1. f(n) = n^6 + 3n
   i n^6
2. f(n) = 2^n + 12
   i 2^n
3. f(n) = 3^n + 2^n
   i 3^n
4. f(n) = n^n + n
   i n^n
5. f(n) = 109
   i 1
6. f(n) = n + $\sqrt{n}$
   i n

2. What is the complexity of the following algorithm?

```
    int n = A.length;
 for (x = 1; x <= n; x++) {
for (y = 1; y <= 200; y++) {
for (z = 1; z <= n; z++) {
if (A[x] == A[z]) {
            System.out.println(A[x]);
          }
        }
      }
    }
```

$f(x) = n^2$

3. Determine which of the following bounds are tight bounds and which are not tight bounds. Check to see if any bounds may be wrong.

1. A Θ(n) algorithm for which we found a O(n) upper bound.
   i true
2. A Θ(n^2) algorithm for which we found a O(n^3) upper bound.
   i false
3. A Θ(1) algorithm for which we found an O(n) upper bound.
   i false

4. A Θ(n) algorithm for which we found an O(1) upper bound.

    i impossible

5. A Θ(n) algorithm for which we found an O(2n) upper bound.

    i true