Homework #1

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For all questions, choose the **best** answer.

1. What is the worst case rate of growth for the following code:

```
for (i = 1; i <= n; i=2*i)

        System.out.println(i);
```

a. $O(n)$
b. $O(n^2)$
c. $O(\lg n)$
d. $O(n \lg n)$
e. $O(2^n)$

2. What is the runtime of the following algorithm:

```
n = A.length
for j = 1 to n – 1
        smallest = j
        for i = j + 1 to n
                if A[i] < A[smallest]
                        smallest = i
        exchange A[j] with A[smallest]
```

a. $\theta(n^3)$
b. $\theta(n)$
c. $\theta(n^2)$
d. $\theta(n \lg n)$
e. $\theta(\lg n)$

3. Which of the following is true?

I. n = $\theta(\lg n)$
II. $n = O(n^2)$
III. $\log n^2 = O(\log n)$
IV. $\log^2 n = O(\log n)$

a. II and III
b. I only
c. II only
d. I and II
e. IV only

For questions 4 and 5, use the master theorem:

4. T(n) = 16T(n/4) + 1
a. $\theta(1)$
b. $\theta(n)$
c. $\theta(\log n)$
d. $\theta(n \log n)$
e. $\theta(n^2)$

5. T(n) = 2T(n/4) + n
a. $\theta(1)$
b. $\theta(n)$
c. $\theta(\log n)$
d. $\theta(n \log n)$
e. $\theta(n^2)$