The papers distributed in class claim the CSP to provide a number of advantages over the PSP. List two of these claims, and describe the data used to support the claims.

Use one of the methods discussed in lecture to derive an asymptotic bound ($T(n) = \Theta()$) for the following recurrence:

$$T(n) = \begin{cases} 1/8 & \text{if } n = 1, \\ 2T(n/3) + n^2 & \text{if } n > 1. \end{cases}$$

Is the following sequence a heap? Justify your answer.

[23 17 14 6 13 10 1 5 7 12]

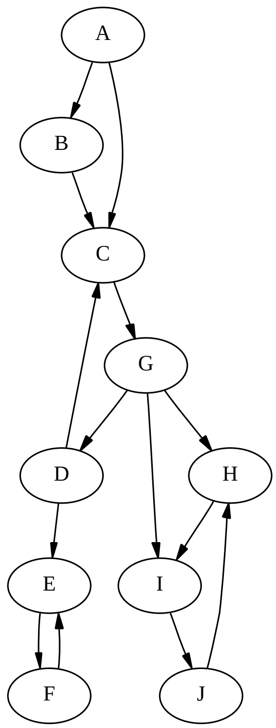
Suppose we use a randomized version (the pivot is picked at random) of the Select algorithm discussed in class and in Chapter 10 of the text to select the minimum element of the array A = $\langle 3, 2, 9, 0, 7, 5, 4, 8, 6, 1\rangle$. Describe a sequence of partitions that result in a worst-case performance for our algorithm and identify the time complexity (using Θ notation) for the worst-case senario.

Recall that the Select algorithm discussed in lecture was:

Select(vector A[1..n], int p, int r, int i)

```
{ // Returns i^th order statistic
  if (p = r)
    return A[p]
  q ← Partition(A, p, r)
  k ← q − p + 1
  if (i ≤ k) {
    return Select(A, p, q, i)
  } else {
    return Select(A, q+1, r, i−k)
  }
}
```

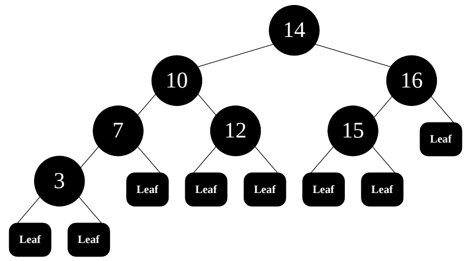
Show the ordering of vertices produced by a topological sort of the following DAG. When more than one search option is available, your algorithm should select the right-most option.



Compare and contrast Kruskal's and Prim's algorithms.

Do the following rotations on the graph below:

- Right-Rotate(16)
- Right-Rotate(14)



What additional rotations are needed in order to produce a tree with a height of three?