Midterm II: Monday, October 8
Scope: Slides 51-129, and notes on Divide and Conquer, Heapsort and Priority Queues, Red-Black Trees (up to insertion, inclusively)

1. Draw the result of applying a right rotation to the element labeled 15 in the following binary search tree:

```
    20
   /   \
  15     26
   |     /  \
   5     17
  /  \
 3    11
```

2. Draw the result of applying a left rotation to the element labeled 12 in the following binary search tree:

```
    30
   /   \
  12     33
   |     |
   7     13
  /  |
 4   12
```

3. Draw the result of applying the TreeDelete operation (slide 117) to the node labeled 25 in the following binary search tree:

```
    30
   /   \
  12     33
   |     |
   7     13
  /  |
 4   12
   /  |
  9   20
 /  |
8   14
```

```
4. Color the nodes of the following binary search tree so that it is a red-black tree:

```
    25
   /   \
  10  40
 /   /  \
4  15 35
```

5. Draw the result of applying RBTreeInsert to insert 48 in the following red-black tree. (Black nodes have double circles. Red nodes have dashed circles.) Indicate which nodes are red or black in your drawing. Be sure that the resulting tree has all the properties of a red-black tree. Show your work, i.e., show the effects of the different algorithm steps on the tree.