

DS Spring 2016 Midterm

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Problem 1

```
def sort5(a, b, c, d, e):
    # sort sublists [a, b] and [c, d, e]
    if d < c:
        swap(d, c)
    if e < d:
        swap(e, d)
    if d < c:
        swap(d, c)
    if b < a:
        swap(b, a)

    # merge lists
    if a < c:
        if b < c:
            return [a, b, c, d, e]
        else:
            if b < d:
                return [a, c, b, d, e]
            else:
                if b < e:
                    return [a, c, d, b, e]
                else:
                    return [a, c, d, e, b]
    else:
        if a < d:
            if b < d:
                return [c, a, b, d, e]
            else:
                if b < e:
                    return [c, a, d, b, e]
                else:
                    return [c, a, d, e, b]
        else:
            if a < e:
                return [c, d, e, a, b]
            else:
                if b < e:
                    return [c, d, a, b, e]
                else:
```

```
return [c, d, a, e, b]
```

Problem 2

```
int DisjSets::find(int x) {
    for (; s[x] != -1; x = s[x])
        if (s[s[x]] != -1)
            s[x] = s[s[x]];

    return x;
}
```

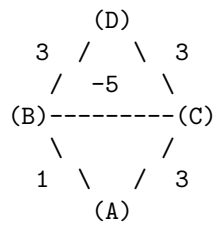
Problem 3

From A to		Path

B		A-->B
C		A-->C
D		A-->C-->D
E		A-->B-->G-->E
F		A-->B-->G-->E-->F
G		A-->B-->G

Problem 4

Finding the path from A to D:



Dijkstra would produce A->B->D, when the shortest path is actually A->C->B->D.

Problem 5

Prim's

Interval trees:

1. (1)-(3)
2. (1)-(3)-(6)
3. (1)-(3)-(6)-(4)

Final:

(1)-(3)-(6)-(4)
 '-(2)-(5)

Kruskal's

Interval trees:

1. (1)-(3) (6)-(4) (2)-(5)
2. (1)-(3)-(6)-(4) (2)-(5)

Final:

(1)-(3)-(6)-(4)
 '-(2)-(5)