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Assignment 3

1a)

1. The edge(b,f) will belong to some parity matchings because p(b) = “even” and there are three edges connected to it, while p(f) = “odd” and there is one edge connected to it.
2. The edge(h,j) will belong to some parity matchings because p(h) = “odd” and there are three edges connected to it, while p(j) = “even” and there is only one edge connected to it.

1b) Let top indicate the top vertex. Assume that every vertex has received an “even” or “odd” status. We set a base case so that if a vertex has no children, the algorithm will stop running. We start by looking at the top vertex and checking if there is a parity matching (e.g. if *p*(top) = “even” and p has two children, we can assume that there are two edges connected to the top vertex and thus, a parity matching exists for this function *p*). If there is, the algorithm returns true. If not, we recursively check for a parity matching on other vertices (note that if the vertex is not labeled as the top vertex, we MUST add 1 to the number of children to account for the edge attached the top of the vertex). If no parity matchings exist for this function *p*, we return false.

1c) At each level of recursion, we are simply checking the number of children that the vertex has and adding one. Both of the operations are constant time. We only call a recursion once per level and the height of the tree is n. Therefore, the worst case for this algorithm is O(N).

2a) This algorithm does not work. Consider the example we were given for problem number 2. We have three times on Monday: let x = 16:00-20:00, y = 18:00-22:00, z = 21:00 to 23:00. We start by considering I­­­­­­x to be x, 16:00-20:00. We have one overlap, y, and this by default has the latest finish time out of the intervals that overlap x. Therefore, we will set y to I­y and add the person with this interval to the safety committee. We then remove interval x and interval y. Interval z is our last interval and we set this to be Ix. There are no other intervals so therefore, the person with interval z will be added to the safety committee list and we remove this interval from the interval list and return 2; however, as we can see from the example, this is wrong and the answer should be 1 as interval y overlaps both x and z.

2b)