Problem Set 13

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1. To reduce Hamiltonian Path Problem problem to Longest Path Problem, we make a simple path to have $|V| - 1$ edges. By doing so, it becomes the longest path since the maximum number of edges of longest path cannot exceed $|V| - 1$, or otherwise there will have a certain vertex being traverse twice. Since the longest path is a single path where no vertex is repeated and all vertices are in the path, it is inherently a Hamiltonian path based on definition.

2. The answers are as follows:

   (a) The Python code is as follows:

```
def rod_cutting(n, prices):
    max_profit = [0 for _ in range(n+1)]

    for i in range(1, n+1):
        max_profit[i] = prices[i-1]
        for j in range(1, i):
            max_profit[i] = max(max_profit[i], prices[j-1] +
max_profit[i-j])
        print(f"Max profit given length {i} is {max_profit[i]}")

    return max_profit[-1]
```

   (b) Assume there are m kinds of prices corresponding to different length price and the target length is n. Then the complexity is $O(m \times n)$.

   (c) The trace given the output above is as follows:

   Max profit given length 1 is 1

   Max profit given length 2 is 5

   Max profit given length 3 is 8

   Max profit given length 4 is 10