Name __Solutoins____ Discrete I, Quiz 28

1) If “Line 4” is the line of interest and everything else is trivial, what is the asymptotic growth rate of this algorithm?

```
for i from 0 to n₁
   “Line 2”
   for j from 0 to n₂
      “Line 4”
      for k from 0 to n₃
         “Line 6”
```

$$O(n_1 \cdot n_2)$$

Remember the loops are nested, so `Line 4` occurs for every one of the n_1 instances of `Line 2`.

However, the third loop is irrelevant because it does not include any `Line 4`'s.

2) Assuming all arithmetic can be done in hardware, find an asymptotic upper bound on the runtime of this algorithm. Give a one-sentence explanation for your upper bound.

```
myFunc(n):
      if n == 0 return 1
      for i from 0 to n-1
            “Line 4”
      return myFunc(n-1)+ myFunc(n-2)
```

The recursive part tells us that we have $O(2^n)$ function calls. However, the runtime is actually longer than that, because the loop causes each function call to have $O(n)$ time. Hence the total runtime is:

$$O(n \cdot 2^n)$$