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CPSC 335
Dr. Bein

Project 4 Algorithm Analysis Report

```
-----  
n=15, rows=7, columns=8  
  
...X....  
.....  
.....  
.X.....X  
.X.....  
.....  
.....X.  
-----  
exhaustive optimization  
Exhaustive: 466  
  
elapsed time=0.0300823 seconds  
-----  
dynamic programming  
Dynamic programming: 466  
  
elapsed time=0.000201553 seconds  
-----
```



```
-----  
n=20, rows=10, columns=10  
  
.X....X...  
.....  
[.....  
.....X..  
[.....  
.X.....X  
.....X...  
.....  
.X....X...  
X....X...  
-----  
exhaustive optimization  
Exhaustive: 6740  
  
elapsed time=0.728966 seconds  
-----  
dynamic programming  
Dynamic programming: 6740  
  
elapsed time=0.000172438 seconds  
-----
```

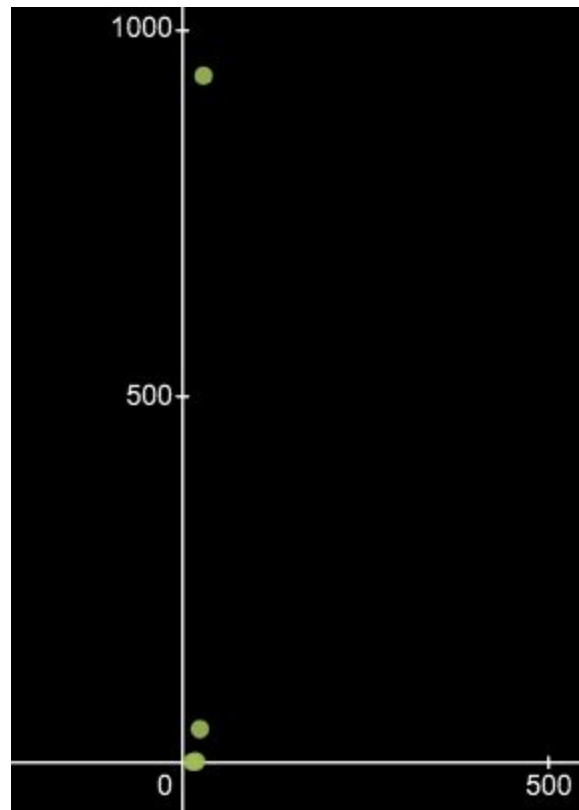
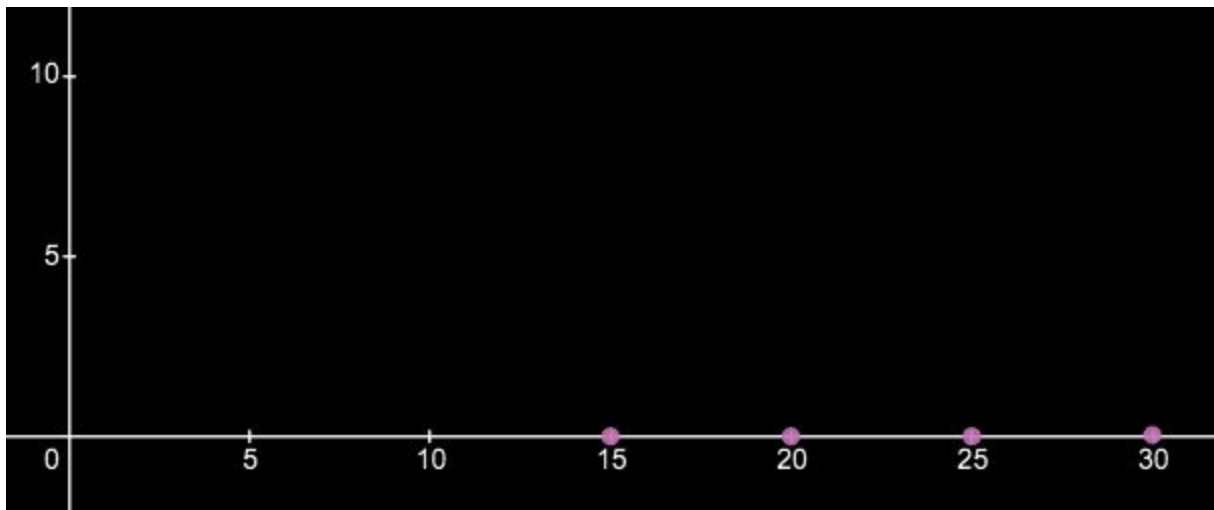
```
-----  
n=25, rows=12, columns=13  
  
...X...X...X  
.....  
[.....X...X..  
.....X.X  
[.....  
..X.X.....  
.....  
.....X  
..X.....X.X.  
.....X.  
.....  
.....X.  
-----  
exhaustive optimization  
Exhaustive: 51190  
  
elapsed time=44.8298 seconds  
-----
```

```
-----  
n=30, rows=15, columns=15  
  
.....X.  
.....X..X....X  
.X.....  
.....X.....  
.....X.X.....  
.....X...X....  
.....X.....  
.....X.....  
.....X.....  
X...X.....  
.....X.....  
.....X..  
...XX.....  
.....X..  
-----  
exhaustive optimization  
Exhaustive: 274462  
  
elapsed time=936.615 seconds  
-----  
dynamic programming  
Dynamic programming: 274462  
  
elapsed time=0.0393305 seconds  
-----
```


E = Exhaustive time

D = Dynamic time


x_1	 E_1	x_2	 D
15	0.0307616	15	0.000166041
20	0.72896	20	0.000172438
25	44.8298	25	0.000182776
30	936.615	30	0.0393305

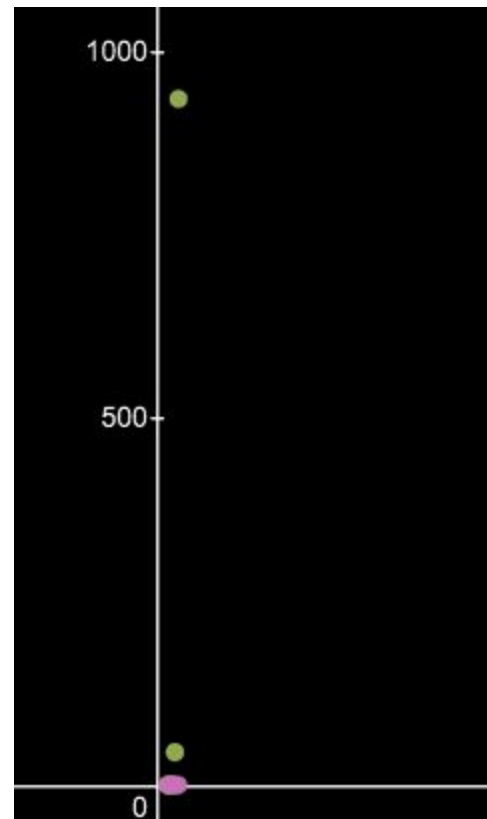
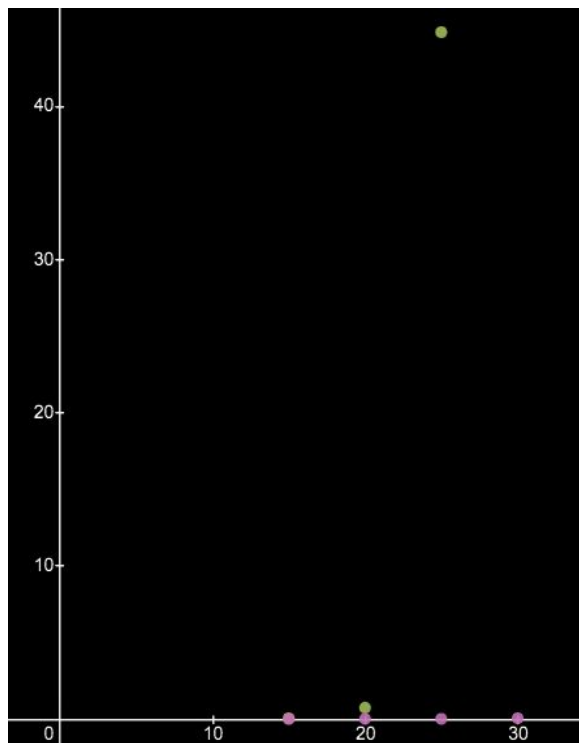


E = Exhaustive time

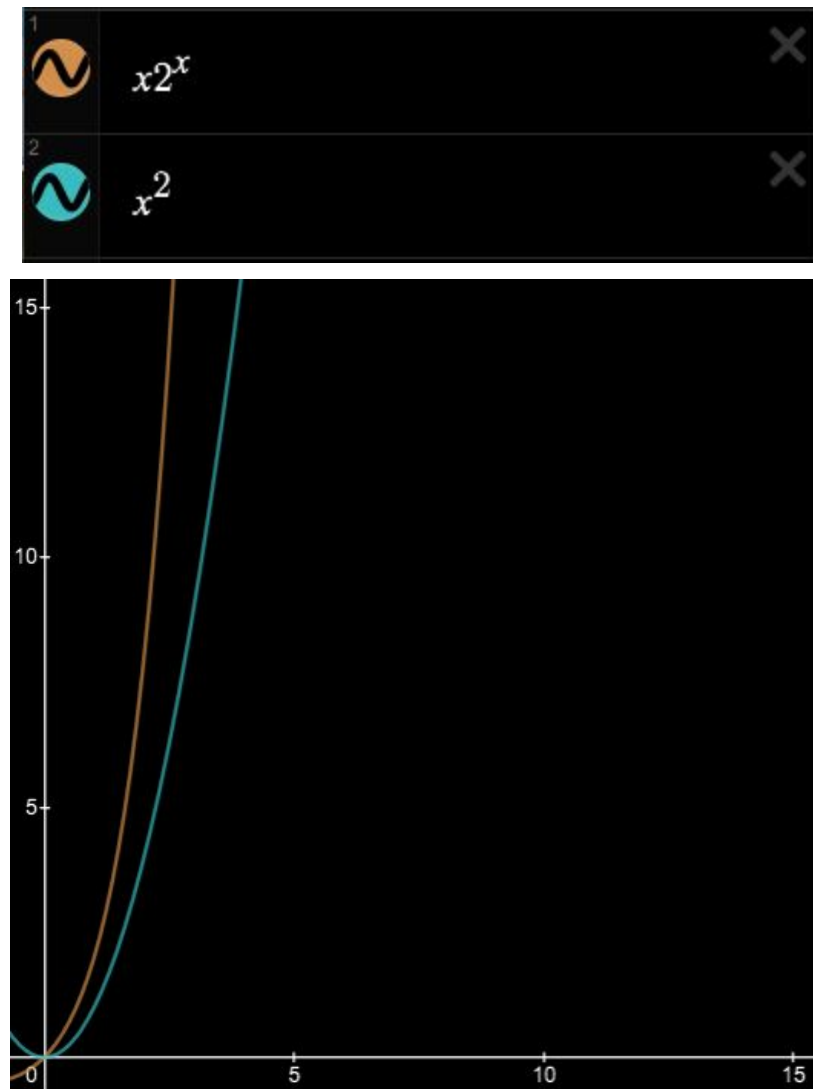
x_1	 E_1
15	0.0307616
20	0.72896
25	44.8298
30	936.615

D = Dynamic time

x_2	 D
15	0.000166041
20	0.000172438
25	0.000182776
30	0.0393305



Time Complexities: Curve Comparison



- a. Are the fit lines on your scatter plots consistent with these efficiency classes? Justify your answer.
- Yes, both fit lines reflect their respective efficiency classes.
 - The scatter plots follow the general trend in line with the curve of its respective efficiency class
- b. Is this evidence consistent or inconsistent with the hypothesis stated on the first page? Justify your answer.
- Yes it is consistent. Based on the difference in time between the two algorithms implemented, polynomial-time dynamic programming algorithm time complexities were found to be more efficient than its exponential-time exhaustive search/optimization counterpart in this analysis.
 - As the size of the grid was increased, the exhaustive search implementation became significantly slower compared to the dynamic-programming one.

- c. **Compare and contrast the difficulty you found in implementing the two algorithms. What was the most challenging part of implementing each algorithm. Overall, which implementation did you find harder, and why? Which algorithm implementation do you prefer?**
- i. This particular exhaustive search algorithm was personally more challenging to implement than the dynamic programming one because of the additional concept of having to convert the path as a binary string of bits. In contrast, the dynamic programming implementation was easier to visualize.
 - ii. The preferred method of implementation would easily have to go to the dynamic programming one because it is significantly more efficient in the long run.