

# MTH 111 Lecture Notes

## SECTION 4.3: EXPONENTIAL FUNCTIONS

In 1988, a judge in Yonkers, New York instituted an *exponential* fine on the city of Yonkers. Below is the background and scenario, published in the New York Times<sup>1</sup>:

**Dec. 1, 1980:** Justice Department sues Board of Education, City of Yonkers and Yonkers Community Development Agency, charging that the city racially discriminated in education and public housing.

**Nov. 20, 1985:** Judge Leonard B. Sand of Federal District Court in Manhattan rules that Yonkers's housing and schools were intentionally segregated by race. A housing remedy order directs the city to build 200 units of public housing and to plan additional subsidized housing.

**Jan. 28, 1988:** City Council approves consent decree that sets timetable for building 200 units of public housing and commits city to an additional 800 subsidized units.

**July 26, 1988:** Court sets Aug. 1 deadline for Council to adopt zoning amendment needed to build the 800 units.

**Aug. 1, 1988:** Council rejects amendment in a 4-to-3 vote.

**Aug. 2, 1988:** Judge Sand finds city and the four Councilmen who voted against the amendment in contempt of court and imposes fines. The city's fines start at \$100 and double every day. The Councilmen's fines start at \$500 a day and increase by \$500 each day.

**Example 1.** Let  $P$  be the amount fined (in dollars)  $t$  days after the fines were imposed. Complete the entries in Table ?? and Table ??.

TABLE 1. Councilmen

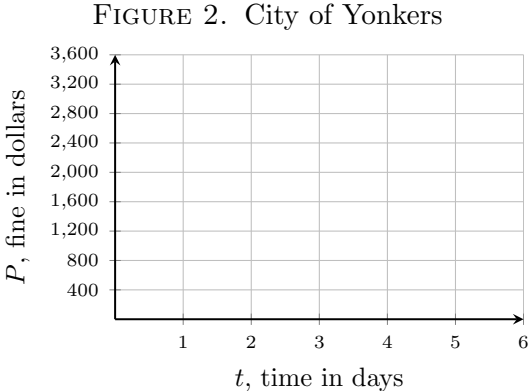
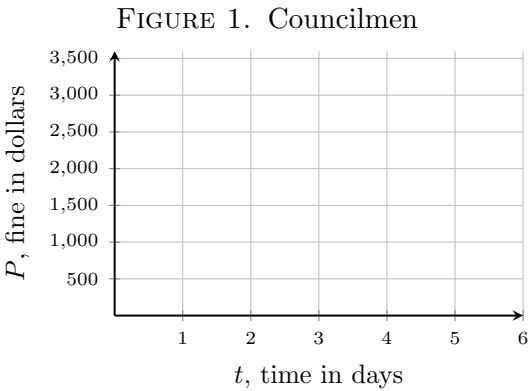
$t$	$P$	Formula
0		
1		
2		
3		
4		
5		
$\vdots$	$\vdots$	$\vdots$
$t$		

TABLE 2. City of Yonkers

$t$	$P$	Formula
0		
1		
2		
3		
4		
5		
$\vdots$	$\vdots$	$\vdots$
$t$		

<sup>1</sup><http://www.nytimes.com/1988/09/10/nyregion/yonkers-legal-battle-how-it-unfolded.html>

**Example 2.** Graph each of the functions you found that model the fines for the Councilmen and the city of Yonkers. Identify the key features of each graph.



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**Group Work 1.** On what day will the city of Yonkers’ fine reach over \$1,000,000?

**Group Work 2.** How much will the city of Yonkers be fined on day 30? What will each of the Councilmen’s fines be on that day?