Name: _____

Exam I - Math 132

- Show all of your work, and clearly indicate what your final answer is. If there are two apparent answers for one question, you will receive no credit for that problem.
- Leave numbers as exact answers. $\frac{1}{3}$ is fine, but .333 is not an acceptable answer.

Problem	Out of	Your Score
1	25	
2	25	
Total	50	

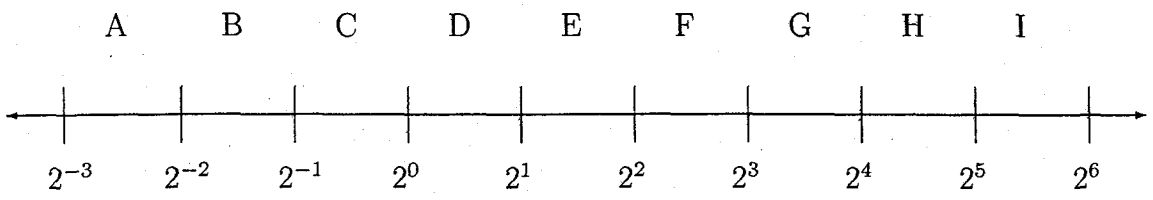

Figure 1: Base 2 Logarithmic Scale

1. We are interested in studying the above logarithmic scale. (5 points each)

   (a) For each of the nine intervals A through I, list how many counting numbers they each contain.

A	B	C	D	E	F	G	H	I

   (b) Mark (approximately) where $\frac{2}{15}$ is on the above scale. Justify your answer.

   (c) Mark (approximately) where $x > 0$ is on the above scale if $6 < \log_2(x^2) < 8$. Justify your answer.

   (d) Which is easier to find on the above log scale, $2^{-1} + 2^2$ or $2^{-1} \cdot 2^2$? Explain.

   (e) Briefly explain why we do not define $\log_a(x)$ for negative a.

2. An elementary school principal notices that the students are struggling with understanding big numbers as well as understanding that rates of change do not always have to be linear. To help make these connections, she tells her students during a school assembly that she has two large jars (which are the same size), and they can each hold a lot of jelly beans. She tells her students that once the jar they pick is full of jelly beans, she will give those jelly beans out to the school. The students need to pick the jar that they think will fill up the fastest. She tells her students that she will place 300 jelly beans in the first jar everyday, until it is full. She will put 1 jelly bean in the second jar on the first day, 2 on the second day, 4 on the third day, 8 on the fourth day, 16 on the fifth day, and so on until that jar is full. (5 points each)

   (a) How many jelly beans will be in the second jar for each of the first seven days?

   (b) How many jelly beans will the first jar have on day t?

   (c) If the jars can hold up to $2,000$ jelly beans on what day would the first jar fill up? The second jar? Which jar is better in this case?

   (d) If the jars can hold up to $8,000$ jelly beans on what day would the first jar fill up? The second jar? Which jar is better in this case?

   (e) What is the smallest "jelly bean capacity" which makes the second jar a better deal? What day does this occur?