

1) [20pts] Compute $A^{[2]}$ (it's a Boolean product), given that

$$A = \begin{pmatrix} 0 & 0 & 1 \\ 1 & 0 & 0 \\ 1 & 1 & 0 \end{pmatrix}$$

2) [20pts] Define a set $S \subset \mathbb{Z}$ recursively by 1) $2 \in S$ and $5 \in S$, and 2) if $a, b \in S$ then $a + b \in S$. Describe S explicitly (a list, like $S = \{3, 7, 11, 15 \dots\}$ is OK, or you might be able to describe S in words, or using a non-recursive formula).

3) [20pts] Suppose that 100 animals at MetroZoo are from Africa, and 50 animals are reptiles, and that 15 are reptiles from Africa. How many of the animals are either reptiles, or from Africa ?

4) [40 pts] Choose ONE: you can answer on the back.

a) If a simple polygon with at least 4 sides is triangulated, then at least two of the triangles have two sides on the border [exterior] of the polygon.

b) Prove that $3^n < n!$ if $n > 6$ is an integer. Notice that $6! = 80(3^2)$ and $3^6 = 81(3^2)$, so it is not true for 6.

Remarks and Answers: The average among the top 20 was approx 70 / 100. The scale for the Quiz is:

A's: 80 to 100

B's: 70 to 79

C's: 60 to 69

D's: 50 to 59

1) This is the first part of Example 11, page 254.

2) $S = \{2, 4, 5, 6, 7, 8 \dots\}$. This is exercise 7 from Ch 4.1, but rephrased in the language of Ch 4.3. Several people assumed (incorrectly) that $a \neq b$, and missed that $2 + 2 = 4 \in S$, for example. Also, see Example 7 in Ch 4.3, which is very similar.

3) $100 + 50 - 15 = 135$ by inclusion-exclusion. Or, you can draw a Venn diagram and get $85 + 15 + 35 = 135$.

4a) This is 4.2.17. See me if you want help with it.

4b) This is 4.1.20. It is the same as Example 6, which we did in class. In the Basis Step, you should compute $7!$ and 3^7 to see which is larger (Indirectly, I gave you some help with these numbers in last part of the problem).