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**Problem 1:** In the RSA, suppose that Bob chooses  $p = 3$  and  $q = 43$ . (a) Determine three correct values of the public exponent  $e$ . Justify briefly their correctness (at most 20 words.)

(b) For one of the  $e$ 's you selected, compute the secret exponent  $d$ . Show your work.

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**Problem 2:** Grabbits are genetically modified rabbits that live forever and reproduce asexually on a precise schedule: each grabbit gives birth to three grabbits every Wednesday starting two weeks after birth. So if you start with 1 newly born grabbit, after one week you will still only have 1 grabbit. After two weeks you will have 4 grabbits, namely your first grabbit plus its 3 offspring. In general, how many grabbits will you have after  $n$  weeks if you start with one newly born grabbit? Set up a recurrence relation for this problem and solve it.

(a) Recurrence relation:

(b) Characteristic polynomial and its roots:

(c) General form of the solution:

(d) Initial condition equations and their solution:

(e) Final answer: