CS344: Design and Analysis of Computer Algorithms

Homework 2

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1.11) Is $4^{1536} - 9^{4824}$ divisible by 35?
Answer:

$4^{1536} = (4^3)^{512} = 64^{512} = (35 + 29)^{512}$
Since 35 is divisible by 35, we can continue with 29^{512}
$29^{512} = (29^2)^{256} = 841^{256} = (840 + 1)^{256}$
Since 840 is divisible by 35, we are left with 1^{256} mod 35

$9^4 824 = (9^2)^{2412} = 81^{2412} = (70 + 11)^{2412}$
Since 70 is divisible by 35, we can continue with 11^{2412}
$(11^3)^{804} = 1331^{804} = (1330 + 1)^{804}$
Since 1330 is divisible by 35, we are left with 1^{804} mod 35

$(1^{256} \bmod 35) - (1^{804} \bmod 35) = 0$. Thus, yes it is divisible by 35.

1.12) What is $2^{2^{2006}}$ mod 3
Answer:

$2^{2^{2006}} = 4^{2006} = 4^{2^{1003}} = 16^{1003} = (15 + 1)^{1003}$
We know 15 is divisible by 3, so that leaves us with 1^{1003}.
Thus, the answer is 1

1.13) Is the difference of $5^{30,000}$ and $6^{123,456}$ a multiple of 31?
Answer:

temp

1.25) calculate 2^{125} mod 127 using any method you choose
Answer:

temp

1.33) Give an efficient algorithm to compute the least common multiple of two n-bit numbers x and y, that is, the smallest number divisible by both x and y. What is the running tie of your algorithm as a function of n?

Answer:

temp

1.39) Give a polynomial-time algorithm for computing a^{b^c} mod p, given a, b, c, and prime p.

Answer:

temp

Problem)

Answer:

temp