

Do NP-completeness homework, Part 3.

1. Assume that your machine has 64 bit words. Assume that you can multiply two n -word numbers in time $4n^2$ with a standard algorithm. Assume that you can multiply two n -word numbers in time $11n^{\lg 3}$ with a “fancy” algorithm.
 - (a) Approximately, how large does n have to be for the fancy algorithm to be better?
 - (b) How many bits is that?
 - (c) How many decimal digits is that?
2. If we want to multiply the two complex numbers $a + bi$ and $c + di$ (where a, b, c, d are integers), the standard method uses four (integer) multiplications. Show that you can do this computation with only three (integer) multiplications.

3. Use the integral method to obtain upper and lower bounds for

$$\sum_{k=1}^n k^{3/2} .$$

Show your work.

4. Use the integral method to obtain upper and lower bounds for

$$\sum_{k=1}^{20} (k - 6.5)^2 .$$

Show your work.