Notes on Computer Science

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Chapter 1

Natural Numbers

1.1 Change of basis

We are looking for a practical, recursive formula to change between bases. The problem is posed as such: given a number q in a base R_1 find the coefficients b_n such that in base R_2

$$q = \sum_{i=0}^{n-1} a_i R_1^i = \sum_{i=0}^{m-1} b_i R_2^i \tag{1.1.1}$$

We can write q as:

$$q_0 = b_0 + R_2 \left(b_1 + R_2 \left(b_2 + R_2 \left(b_3 + R_2 \left(b_4 + R_2 \cdots \right) \right) \right) \right) = b_0 + R_2 q_1 \tag{1.1.2}$$

Or in general

$$q_j = b_j + R_2 q_{j-1} \tag{1.1.3}$$

So, given q, we can divide through by R_2

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