4/4. Chapter 3.

1. 1) 流水线时钟周期由最长流水级决定.

$T_{pipe} = T_{MEM} + T_{reg} = 2ns + 0.1ns = 2.1ns$

2) 执行时间比 $S = \frac{T_{pipe} \times CPI_{pipe} \times N_{instruction}}{T_{cycle} \times CPI_{cycle} \times N_{instruction}} = \frac{T_{pipe} \times CPI_{pipe}}{T_{cycle} \times CPI_{cycle}}$

加速比 $= \frac{1}{S} = \frac{T_{cycle} \times CPI_{cycle}}{T_{pipe} \times CPI_{pipe}} = \frac{7 \times N}{2.1 \times (N+5-1)} = \frac{7}{2.1} = \frac{10}{3}$ $(N >> 4)$.

3) $\frac{CPI_{pipe}}{CPI_{cycle}} = \frac{N+K-1}{N}$ 总认为 $N >> K$.

当有无限多流水级时, 每个流水级所需时间无限接近0.

则流水线处理器的时钟周期由寄存器延迟决定, 为0.1ns

加速比为 $\frac{T_{cycle}}{T'_{pipe}} = \frac{7ns}{0.1ns} = 70$.