Today’s Plan

Upcoming:
➤ Quiz #2 today!
➤ Assignment 1

Today’s topics:
➤ From last time:
  ➤ Software Solutions to the Critical Section Problem
  ➤ A Hardware Solution to the Critical Section Problem
➤ Semaphores

Last time:
➤ The critical section problem
➤ Conditions for a solution
Semaphores

Semaphores are used to synchronize the actions of processes

Both P and V are *atomic*

P(S) blocks the calling process if $S \leq 0$, once unblocked it decrements S.

V(S) increments S. If $S > 0$ then one process blocked on P(S) becomes unblocked.
Semaphores

\[ P(S) : \]

\[ V(S) : \]
Semaphores

- The value of a semaphore is the "memory" of the difference between the number of V's and P's called e.g. 1 - critical sections:
  - (Initially, $S = 1$)
Semaphores

- e.g. 2 - process synchronization (want S1 to complete before S2 begins)
- (Initially, S = 0)