CSCI 176 (Parallel Processing): topics covered for exam2 (Spring 2020)
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* Shared-mem Programming with Pthreads
  - issues: critical section, thread synchronization
  - static vs. dynamic threads
  - each thread has its own stack/heap (private space)
  - matrix-vector multiplication, matrix multiplication, pi computation in Pthreads
  - critical section and mutex in Pthreads
  - producer-consumer synchronization and semaphore in Pthreads
  - barrier synchronization and condition var in Pthreads
  - read-write locks in Pthreads
  - cache access pattern, cache coherence, and false sharing

* Shared-mem Programming in OpenMP
  - pragma omp parallel block and team
  - trapezoid computation (integral) in OpenMP
      versions: ref para, return type slave func, reduction in main(), par-for in main()
  - parallel-for directive and loop-carried dependence – pi computation
  - scope of vars
  - loops in OpenMP – parallel sorting algorithms
  - scheduling loops: static/dynamic/guided scheduling
  - producer-consumer synchronization in OpenMP: enqueue(), dequeue()
  - nested critical and deadlock

* Interconnection Networks
  - shared-mem IN: bus, X-bar
  - distributed-mem IN: static (direct), dynamic (indirect)
  - terminology: node degree, network diameter, bisection width
  - static (direct) IN and routing schemes:
      completely connected
      linear array: E-W routing
      ring: tag +/- 1 MOD N
      2D mesh: E/W and X/Y routing
      3D mesh: E/W, X/Y, in/out routing
      2D/3D torus: mesh + ring
      hypercubes (1-4D)
      cube-connected-cycle (CCC)
      tree (binary, m-ary)
      star
  - dynamic (indirect) IN and routing scheme:
      bus, crossbar, MIN
      MIN: shuffle, inverse-shuffle
          Omega network: # of stages/switches, dest_id routing
          Benes network: # of stages/switches, routing mechanism, total # of paths