

CS 460

Threads

Pthread Functions

- pthread_create
- pthread_cond_init
- pthread_mutex_init
- pthread_attr_init
- pthread_mutex_lock / unlock
- pthread_cond_wait / pthread_cond_timedwait
- pthread_cond_signal / pthread_cond_broadcast
- pthread_mutex_destroy
- pthread_attr_destroy
- pthread_cond_destroy
- pthread_exit/pthread_join
- pthread_kill / pthread_detach
- pthread_setaffinity_np sched_setaffinity

Estimate Pi

$$\sum_{k=1}^{\infty} \frac{1}{k^2} = \frac{1}{1^2} + \frac{1}{2^2} + \frac{1}{3^2} + \frac{1}{4^2} + \dots$$

Sharks & Fishes

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Matrix Multiply

```
typedef struct matrix
{
    int rows;
    int columns;
    int **data;
} matrix;
```

$$\begin{array}{c} 3 \times 4 \text{ matrix} \\ \begin{bmatrix} \cdot & \cdot & \cdot & \cdot \\ \cdot & \cdot & \cdot & \cdot \\ 1 & 2 & 3 & 4 \end{bmatrix} \end{array} \begin{array}{c} 4 \times 5 \text{ matrix} \\ \begin{bmatrix} \cdot & \cdot & \cdot & a & \cdot \\ \cdot & \cdot & \cdot & b & \cdot \\ \cdot & \cdot & \cdot & c & \cdot \\ \cdot & \cdot & \cdot & d & \cdot \end{bmatrix} \end{array} = \begin{array}{c} 3 \times 5 \text{ matrix} \\ \begin{bmatrix} \cdot & \cdot & \cdot & \cdot & \cdot \\ \cdot & \cdot & \cdot & \cdot & \cdot \\ \cdot & \cdot & \cdot & x_{3,4} & \cdot \end{bmatrix} \end{array}$$

$$x_{3,4} = (1, 2, 3, 4) \cdot (a, b, c, d) = 1 \times a + 2 \times b + 3 \times c + 4 \times d.$$

What is our serial solution?

```
matrix sMatA, sMatB;
matrix sMatSolution;
```

```
fillMatrix(&sMatA);
fillMatrix(&sMatB);
```

```
allocateMatrix(&sMatSolution, sMatA.rows, sMatB.columns)
```

```
serialMultiply(sMatA, sMatB, &sMatSolution);
```