Goal:

Manipulation of BMP image files:
(1) Mirror an image horizontally (left and right) using threads.
(2) Mirror an image vertically (up and down) using threads.

Objective: Developing experience with multi-threads in C.

Background: A ***mirror image*** is a reflected duplication of an object that appears identical but reversed. As an optical effect it results from reflection off of substances such as a mirror or water.

Download: Download and unpack file lab7.zip from Camino. It contains a partially completed program (main7.c), a pre-compiled library file (libbmp3.a) for manipulating BMP image files, and an associated include file (bmp3.h).

Assignment: Complete the source code for each the following four functions that are located within the provided main program (main7.c):

```
void *ThreadMirrorRows(void *arg) ;
```

Worker function that reverses rows of an image. The argument passed determines which rows to reverse.

Note: Simply reverses the order of the symmetrical *pxlrow* pointers

```
IMAGE *MirrorUpDown (IMAGE *image) ;
```

Reverses the rows of an image by creating and executing NUM_THREADS of threads concurrently. Each thread executes the worker function **`ThreadMirrorRows`** that reverses one part of the image.

When done correctly, the result should look similar to the example below:

Original Image

Mirrored Image

`void *`**`ThreadMirrorCols`** `(void *`*`arg`*`) ;`
Worker function that reverses columns of an image. The argument passed determines which columns to reverse. Note: Simply reverses the pixels of symmetrical columns of the *image*.

`IMAGE *`**`MirrorLeftRight`**`(IMAGE *`*`image`*`) ;`
Reverses the columns of an image by creating and executing NUM_THREADS of threads concurrently. Each thread executes the worker function **`ThreadMirrorCols`** that reverses one part of the image.

When done correctly, the result should look similar to the example below:

Original Image	***Mirrored Image***
	

Compilation: Compile and link your program using the following command line:

```
gcc –o lab7.exe main7.c bmp3.a -lpthread
```

Execution: Execute your program using the following command syntax:

`Lab7.exe` *src-file dst-file {option#}*

When Done: Demonstrate proper operation of your program to the teaching assistant and upload the completed source code for file main7.c to the lab drop box on Camino. Do not upload any other files.