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Assignment 3: Part C

computing_intensive.c

Q. How does increase in MAX_NUM value affect page allocation?

A. In the program computing_intensive.c, the constant MAX_NUM is responsible for the number of calls to the function ifPrime(). If we increase the value of MAX_NUM, the calls to the function will also increase. As we know, the functions and variables are stored in stack section of the virtual address. As the number of function calls increase, the stack will also grow and eventually the number pages in the memory will also increase. Due to this change the program will take longer to execute because the swapping of pages will increase and indirectly the system performance will be affected.

memory_intensive.c

1. **What is the difference between first and second for loop?**
   First for loop traverse rows first (row-wise) then look for the columns inside it. For example, i will remain same till the j reaches its limit i.e. value of columns. On the other hand, second loop traverse columns first (column-wise) and then access the rows inside it. For example, j will remain same till the i reaches its limit i.e. value of rows.
2. **How many pages are allocated for the matrix?**
   The matrix indexes are allocated as the size of unsigned long which is 8 bytes in size. There are 100 rows and 512 columns. Total no of bytes is (8*51200) 409,600 bytes. If the page size is considered to be 4 KB in size, then number of pages are 100.
3. **Which loop performs better?**
   The first loop is better. The time complexity for both the loops are same O(n^2). But while accessing the memory location in row wise traversing, there are more chances of getting (i+1) th location already in the memory (a hit), which will reduce the swapping time.
4. **What happens if the number of rows increase?**
   If we increase the value of rows, then the memory allocation will be increased. It will affect the execution time as we are allocating more memory which means allocating a greater number of pages.
5. **What happens if the number of columns increase?**
   If we increase the value of columns, then there will be less memory allocation increase than increasing the rows. Eventually a smaller number of pages will be required.