Concordia
UNIVERSITY

COURSE	NUMBER	SECTION	
COMP	471/671	Y	
EXAMINATION	**DATE**	**TIME**	**# OF PAGES**
Final Examination	December 8, 1994	14:00-17:00	1+1

INSTRUCTOR

Tao Li

MATERIALS ALLOWED: ☐ NO ☒ YES (PLEASE SPECIFY) Writing and drawing materials

CALCULATORS ALLOWED: ☐ NO ☒ YES

SPECIAL INSTRUCTIONS:

1. Answer all the questions .
2. Concise answers will be appreciated.
3. Exam must be returned.

EXAM MUST BE RETURNED

1. (2 points) Suppose an RGB raster system is to be designed using an 8-inch by 10-inch screen with a resolution of 100 pixels per inch in each direction. If we want to store 6 bits per pixel in the frame buffer, how much storage (in bytes) do we need for the frame buffer?

2. (2 points) Consider two raster systems with resolutions of 640×480 and 1280×1024. How many pixels could be accessed per second in each of these systems by a display controller that refreshes the screen at a rate of 60 frames per second? What is the access time per pixel in each system?

3. (2 points) Suppose you have a system with an 8-inch by 10-inch video monitor that can display 100 pixels per inch. If memory is organized in one-byte words, the starting frame-buffer address is 0, and each pixel is assigned one byte of storage, what is the frame-buffer address of the pixel with screen coordinates (x,y)?

4. (5 points) Write an algorithm to scan convert the interior of a specified ellipse into solid color.

5. (5 points) Modify a line-drawing algorithm so that the intensity of the output line is set according to its slope. That is, by adjusting pixel intensities according to the value of the slope, all lines are displayed with the same intensity per unit length.

6. (6 points) Prove that the multiplication of transformation matrices for each of the following sequence of operations is commutative:
   - Two successive rotations.
   - Two successive translations.
   - Two successive scalings.

7. (6 points) Write an algorithm to implement rotations in increments of 90^{o} in frame-buffer block (BitBlt) transfers.

8. (7 points) Write an algorithm to identify concave polygons.

9. (5 points) Given the plane parameters A, B, C, and D for **all** surfaces of an object, devise an algorithm to determine whether any specified point is inside or outside the object. (Remember that $Ax + By + Cz + D = 0$ defines the plane equation.)