Name _____

CS-321 Quiz 1
Thursday 11 September 2003

You are designing a high-end video switch that accepts several video sources as inputs and outputs any combination of these signals to up to 4 video sinks (usually monitors, but perhaps other switches). Each input and output was designed with a dot clock fast enough to support a resolution of 1152 by 864 at a refresh rate of 85 Hz, with 20% safety factor that was to cover blanking intervals and some headroom for slightly higher dot rates.

For marketing purposes, your company wants to advertise a dot rate that includes a 15% safety factor for the blanking interval. **What dot rate should they advertise?**

What is the maximum refresh rate that can be input to the switch at a resolution of 1600 by 1200 pixels assuming that 10% of additional bandwidth is needed for the blanking interval?

Name _____

CS-321 Quiz 1
Thursday 18 September 2003

On Monday, we discussed two methods of rasterizing (calculating integer pixel coordinates and values for) a line. On Wednesday, we discussed a third method, Bresenham's algorithm.

State the main advantage of the DDA (digital differential analyzer) algorithm over direct implementation of the equation of a line. (3 points)

State the main advantage of Bresenham's line-drawing algorithm over the DDA algorithm. (3 points)

We learned that multiplications are "more expensive" than additions for computer hardware to implement. **State** two non-price ways that in which this is normally true in computer hardware.

1. (2 points)

2. (2 points)

Name _____

CS-321 Quiz 1
Thursday 25 September 2003

One method that we discussed for drawing a circle was to calculate coordinates directly from the parametric equations in polar form. To ensure that no pixels were missed, we defined $\Delta \theta = 1/r$.

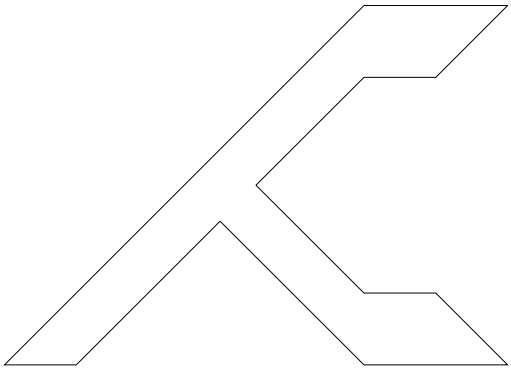
For a circle of radius 50, how many pixels will be calculated when using this method? (Assume that no symmetries are taken advantage of.) Show your work.

For a circle of radius 50, how many points will be drawn by the midpoint circle algorithm? (Consider how many points are drawn in an octant. Try to calculate as accurately as possible; you will not be penalized for off-by-1 errors if your general approach is correct.) Show your work.

Name _____

CS-321 Quiz 3
Thursday 2 October 2003

Open notes, books, calculator



Draw the complete bucket data structure for filling the above shape; include the scanline structure and the referenced edge structures. Be sure to consider which edges need to be shortened or eliminated.

Name _____

CS-321 Quiz 4
Thursday 16 October 2003

Materials allowed: calculator

Define R as a 3×3 homogeneous transformation matrix that rotates a point or set of points by positive 45° (counterclockwise). (3 pts.)

Define T as a 3×3 homogeneous transformation matrix that translates a point at the origin to (1, 1). (3 pts.)

Define P as the point at (1,1) in homogeneous coordinates: $\mathbf{P} = [1\ 1\ 1]^{\mathbf{T}}$.

Compute RTP. (2 pts.)

Compute TRP. (2 pts.)

Name _____

CS-321 Quiz 4
Thursday 23 October 2003

Materials allowed: calculator

Define R as a 3×3 homogeneous transformation matrix that rotates a point or set of points by positive 36.87° (counterclockwise). Note that cos(36.87°) = 0.8 = 4/5. Show your work, including the all values in the matrix. (3 pts.)

Define T as a 3×3 homogeneous transformation matrix that translates a point at the origin to (1, 1).

$$T = \begin{pmatrix} 1 & 0 & 1 \\ 0 & 1 & 1 \\ 0 & 0 & 1 \end{pmatrix}$$

Define U as a 3×3 homogeneous transformation matrix that translates a point at (1, 1) to the origin. (2 pts)

Compute TU. Show your work. (2 pts)

Show which matrices would need to be multiplied to rotate points by 36.87° about (1, 1). Express your answer as a matrix multiplication (e.g., $\mathbf{AB^{-1}CD}$). You may use $\mathbf{R^{-1}}$ if needed. (3 pts)

Name _____

CS-321
(Halloween − 1) 2003
Quiz 5

A triangle is defined with the following vertices: (24,24), (15,0), (0,0).

Using homogeneous transformations:

1. translate the centroid of this triangle to the origin;
2. rotate it 16.26° clockwise about the origin;
3. and shrink it by a factor of 2.

Hints:

- $\cos 16.26° = 24/25 = 0.96$
- $\cos^2 \theta + \sin^2 \theta = 1$
- The centroid of a triangle is the Cartesian average of its 3 vertices.

Show all work, including:

- the basic transformation matrices used;
- the composite transformation matrix (product of basic transformation matrices);
- and the transformed vertices.

Name _____

CS-321
6 November 2003
Quiz 6
(open book and notes)

Clip the polygon representing the letter "M" to the rectangular window using the **Weiler-Atherton** algorithm. Start at V_1 and proceed clockwise. **Show your work (boundaries followed, etc.) and clearly identify your answer.**