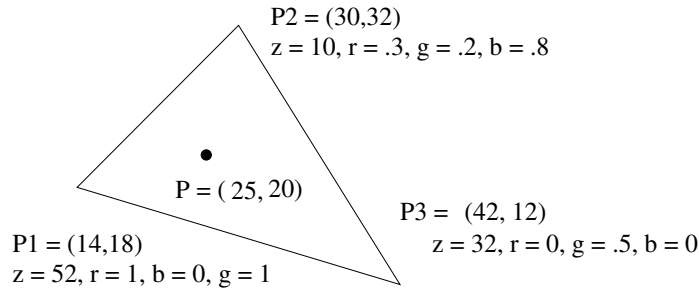


CPSC 414, Written Homework 2

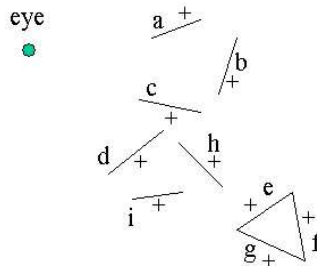
Out: Wed 12 Nov 2003
Due: Fri 21 Nov 2003 9am
Value: 7% of final grade

Total Points: 31

1. (1 pts) Interpolate the value of z for the point P using bilinear interpolation.

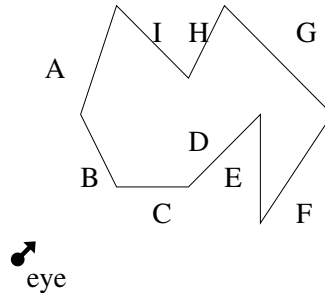


2. (2 pts) Interpolate the value of z for the point P by writing a plane equation in $x, y,$ and $z,$ and solving this for the given point $P.$
3. (1 pts) Determine the barycentric coordinates of point $P.$ Interpolate the values of z and the r, g, b color.
4. (3 pts) Build a BSP tree for the following scene using the polygons (shown as lines) as cutting planes. You should build your BSP tree by inserting the polygons into the BSP tree in alphabetical order. Represent the '+' side of each cutting plane as the right child and the '-' side as the left child.



5. (2 pts) Use your BSP tree to produce a painter's algorithm ordering from the given eyepoint. Show your work.
6. (2 pts) How will a BSP tree deal with 3 cyclically-overlapping polygons?
7. (1 pt) Sketch the colour gamut of a monitor having cyan, magenta, and yellow phosphors. Would this make a good monitor? Why or why not?
8. (2 pts) The appearance of a colour image depends on the display device. If an identical colour image is displayed on two colour monitors, why might the displayed result not be identical? List in point form as many reasons as you can think of, and be as specific as possible.
9. (5 pts) Clip the triangle that has VCS coordinates of $P_1 = (-4, -5, -7), P_2 = (0, -6, -10), P_3 = (0, -4, -12)$ to the perspective viewing frustum given by bottom = -1, top = 1, left = -1, right = 1, near = 3, far = 9. Show your intermediate results, and use the following clipping order: top, bottom, left, right, near far.
10. (8 pts) Develop an integer-only algorithm for rasterizing a circle C centered at $(0,0)$ and of radius $r,$ where r is an integer.

11. (2 pts) For the following scene, the polygons forming a closed solid are represented by edges. Which faces would be removed by backface culling?



12. (3 pts) Sketch the graphics pipeline and indicate where the following are performed a) clipping b) Gouraud shading c) Z-buffer computations
13. (2 pts) Briefly describe the problem of gimbal lock, and list two methods of computing rotations that solve this problem.
14. (3 pts) In Situation A, you render a scene with 10,000 polygons into a 640x480 pixel framebuffer. In Situation B, your scene has 1000 polygons and your buffer is 4800x2400 pixels. Briefly discuss which hidden surface removal methods would be efficient for each scene, justifying your decision in terms of the distinction between image space and object space.
15. (2 pts) You have a checkerboard image where each square is 5x5 pixels. How close together would your sample points be at the Nyquist Rate?