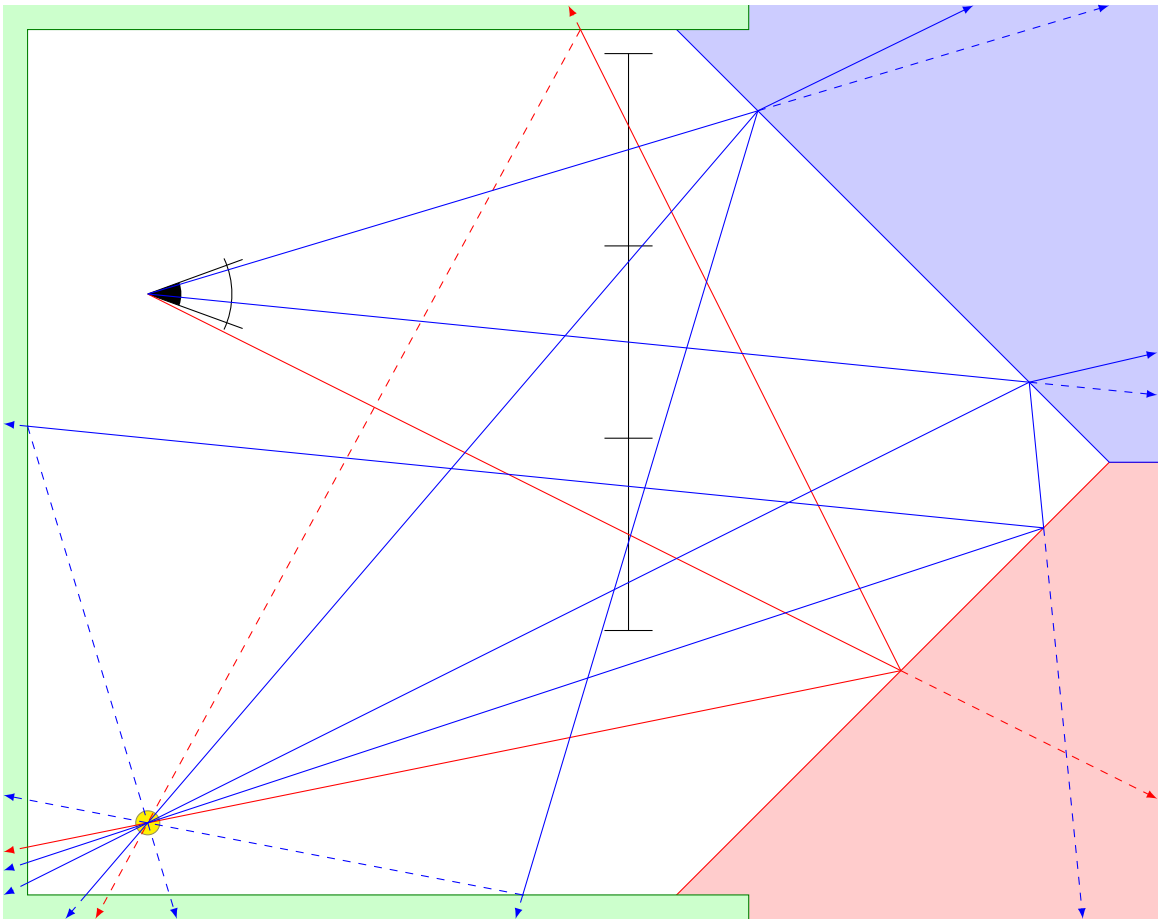
CS 230, Quiz 2

Solutions

There is one question. No books, notes, or other aids are permitted.

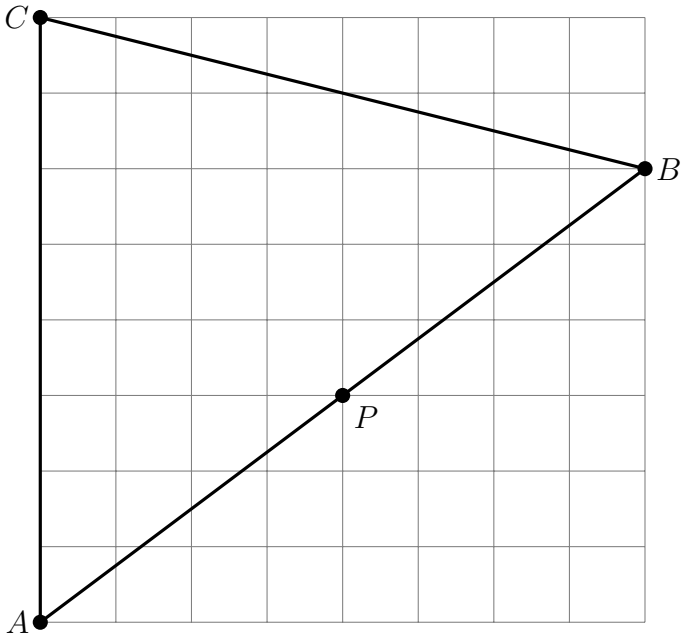
In the raytracing problems below, green objects are wood, red objects are reflective, and blue objects are transparent. The scenes are in 2D with a 1D image. yellow circles are point lights; the ray tracer supports shadows. Draw all of the rays that would be cast while raytracing each scene. Use a maximum recursion depth of 3. (Don't worry about precisely what counts as depth 3; I just care that recursion is being performed correctly when necessary and that important rays are not missing. There are no more than 20 rays in the "exact" solution.)

Problem 1 (4 points)



Problem 2 (4 points)

Compute the barycentric weights of the point P.



P is at the midpoint of one of the edges, which makes the barycentric weights easy: $\alpha = \beta = \frac{1}{2}$, $\gamma = 0$.

Problem 3 (4 points)

Let R be the ray with endpoint $(2, -3, 1)$ and direction $(0, 1, 0)$. Let S be the sphere centered at the origin with radius 3. Find all intersection *locations* between the sphere and the ray.

The ray is given by $x = 2$, $y = -3 + t$, $z = 1$. The sphere is given by $x^2 + y^2 + z^2 = 9$. Substituting in gives $4 + (t-3)^2 + 1 = 9$ or $(t-3)^2 = 4$ so that $t - 3 = \pm 2$. This gives two solutions $t = 1$ and $t = 5$. These correspond to the locations $(2, -2, 1)$ and $(2, 2, 1)$.