

## ASTR 2030 Black Holes Fall 2011. Homework 1. Due in class Tue Sep 13.

There will be a help session on this Homework 6-7pm Mon Sep 12 in Duane G125.

### Draw a Relativistic Scene

Don't forget to put your name and ID on whatever you hand in!

Use *one* of the accompanying templates provided, or otherwise, to draw a scene as it would appear to you if you were moving through the scene at near the speed of light.

Each “normal” scene is a 360 degree panorama, with a forward view, two side views (left and right) and a rearward view. The lines are lines of latitude and longitude projected on to your view, with the north pole directly ahead, and the south pole directly behind. If you imagine sitting at the center of a sphere, like the one in the box on the back of this page, and taking pictures to left, front, right, and behind, then the pictures will look like the 4 parts (left, fore, right, aft) of each normal scene.

Each relativistically distorted scene shows the same view as seen at a fraction of the speed of light – 60%, 80%, 90%, and 95%. To each line in the “normal” scene there is a corresponding line in the relativistically distorted scene.

Note that you should fill in only *one* of the 4 relativistically distorted scenes, not all 4 (unless you really want to). If you prefer not to use the templates provided, that is fine. For example, you might like to use some kind of computer program.

My own attempt at a scene (seen at various velocities) is on the class website, at [http://jila.colorado.edu/~ajsh/astr2030\\_11/homewk.html](http://jila.colorado.edu/~ajsh/astr2030_11/homewk.html)

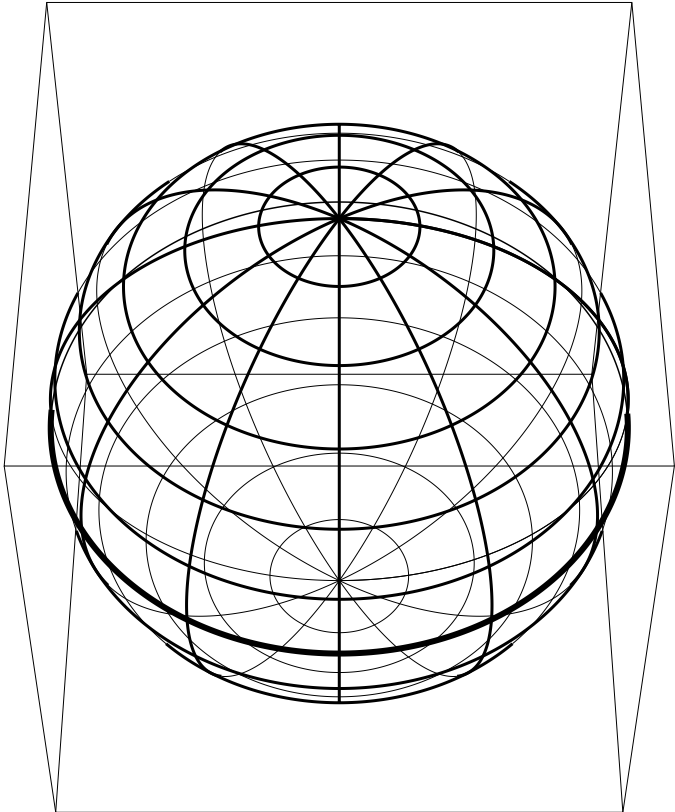
Please do not copy my scene! It's there as an example. Use your own imagination and artistic sensibility to come up with your own original scene.

So what should you do? First, you should decide on a suitable panoramic view that you think will show relativistic distortions to good advantage. One of the key things is that straight lines can appear bent, so it is good for your scene to contain things having straight lines (like buildings). Having drawn your panoramic scene in the “normal” view, you need to transcribe it to the relativistic view by matching corresponding lines (the ones of latitude and longitude).

Do you need to show redshifts/blueshifts or dimming/brightening? It's optional, but you might like to.

Your scene will be graded on: (1) clarity of the relativistic effects it shows, (2) effort, (3) originality, (4) artistic merit.

As a prize, 1% extra credit will be awarded for what the TA and I judge to be the best scene.



The 'Normal' diagrams show the projection of the lines of latitude and longitude of a sphere on to four sides of a box, as illustrated above.