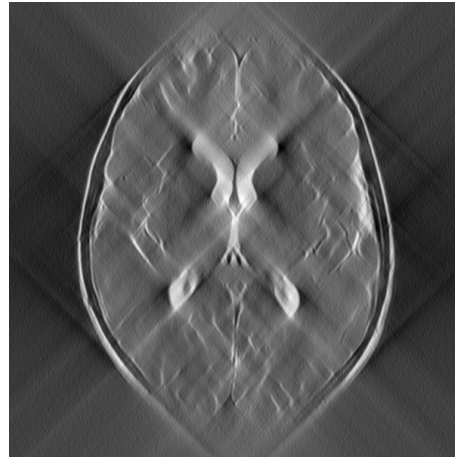
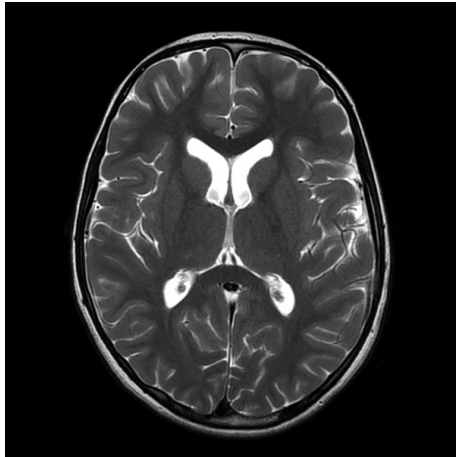


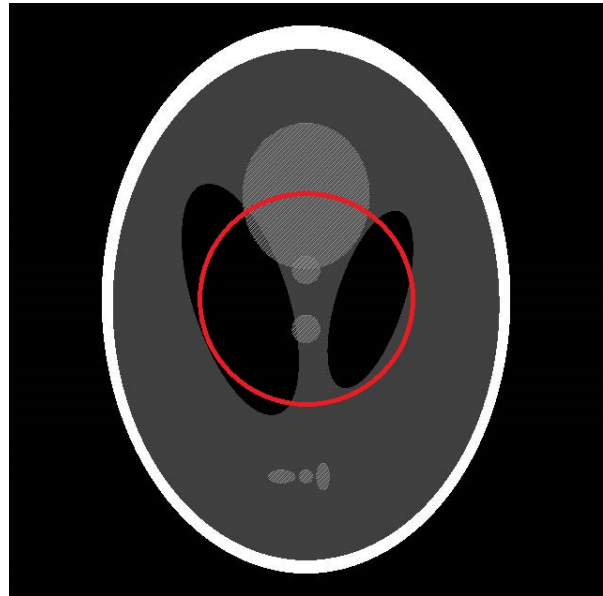
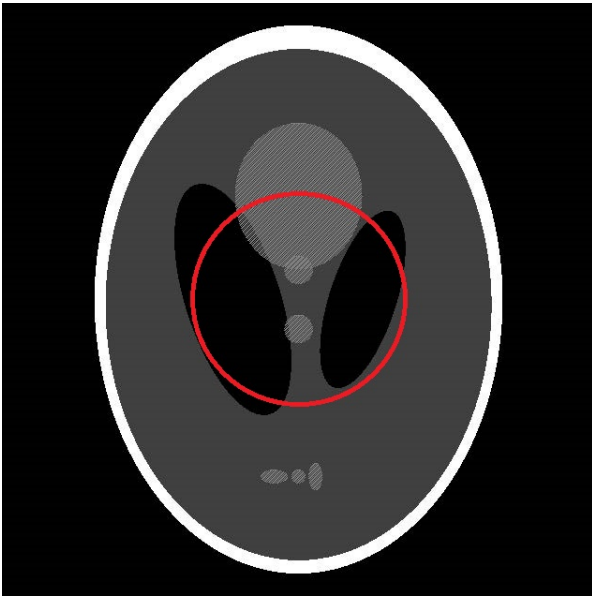
These are informal exercises on the material you are learning about. We will discuss some of them during class, and you can think about the others after class.

1. Consider the phantom on the left and the limited data reconstruction on the right. Look at the reconstruction and what we have learned to answer these questions.



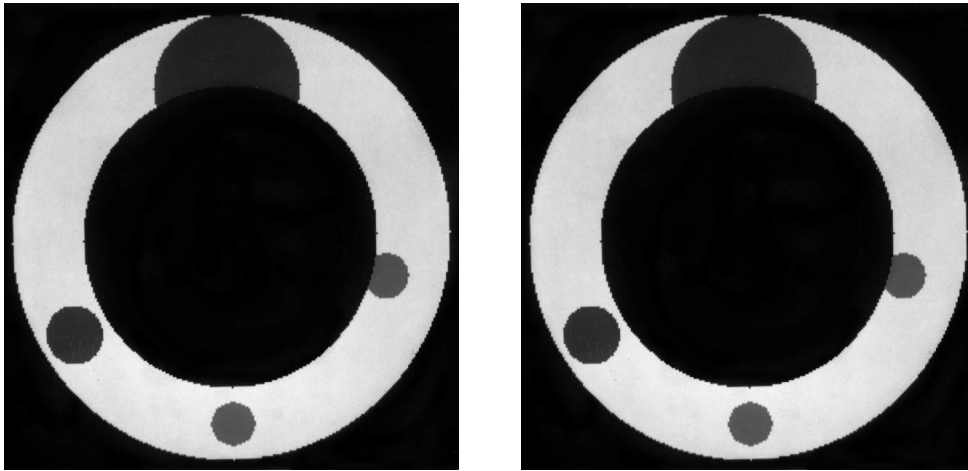
- (a) Which features of the brain are visible in the reconstruction?
- (b) Which are invisible?
- (c) Are there added streak artifacts?
- (d) Use this information to determine the data domain for this reconstruction: the set of (θ, s) that parametrize lines $L_{\theta, s}$ in the data set.

2. Let's say you have a ROI data set of the Shepp-Logan phantom pictured here for lines that are inside the red circle. In your answer to this question, please feel free to write on either phantom.

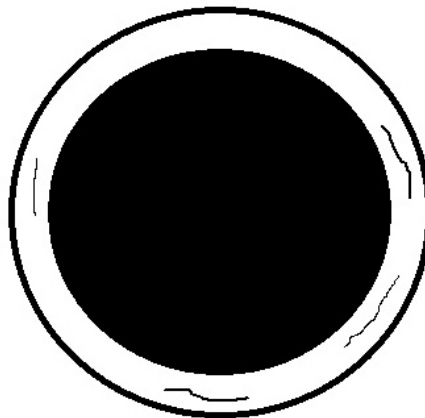


- (a) According to the theory, what object boundaries would be easy to reconstruct from the ROI data *inside the ROI*?
- (b) According to the theory, what types of object boundaries would be difficult to reconstruct from the ROI data *inside the ROI*?
- (c) According to the theory, what object boundaries would be easy to reconstruct from the ROI data *outside the ROI*?
- (d) According to the theory, what types of object boundaries would be difficult to reconstruct from the ROI data *outside the ROI*?
- (e) Did you observe these theoretical predictions in the reconstructions you did in exercises using iRadon? If not, any ideas why not?

3. Consider the phantom in the figure below, and predict what you would expect in a reconstruction from exterior data over lines that do not go through the black central disk. Feel free to draw on either phantom.



- What boundaries should be easy to see in an exterior reconstruction of the phantom?
 - What boundaries should be difficult to see in an exterior reconstruction of the phantom?
 - Do you think there could be artifact curves? If so, what would they be? (NOTE: think about artifacts in ROI CT—we did not really cover this, so you are making a conjecture.)
4. Defects in rocket shells are often along the circumference direction of the shell. For example, a separation in a gasket between two parts of the rocket shell is a worrisome defect that occurred when the U.S. space shuttle Challenger blew up in 1986.



- Would exterior CT be a good modality for such defects?
- According to the theory, what types of defects would be easy to see from exterior CT?
- According to the theory, what types of defects would be difficult to see from exterior CT?
- Do you think there *could* be added artifacts in reconstructions from exterior data? Why or why not?