

## Galactic Astronomy, Spring 2017

## PROBLEM SET IV

**Deadline:** 5PM OF WEDNESDAY, MAY 17, 2017

1. **H I Column density (15%).** A galaxy at a distance  $D$  Mpc is observed to have 21-cm flux  $S(v)$  Jy at velocity  $v$  km s<sup>-1</sup>. Given that the 21-cm emission is optically thin, show that the mass of H I in this galaxy is

$$\frac{\mathcal{M}}{\mathcal{M}_{\odot}} = 2.36 \times 10^5 \left( \frac{D}{\text{Mpc}} \right)^2 \left( \frac{\int_{-\infty}^{\infty} S(v) dv}{\text{Jy km s}^{-1}} \right).$$

2. **De Vaucouleurs  $R^{1/4}$  law (15%).** Find the  $B$ -band photometric data for NGC 1439 given by Capaccioli, Piotto, & Rampazzo (1988, AJ, 96, 487).
- (a) (10%) Plot surface brightness profiles for both the photometric major and minor axes and convince yourself that  $R^{1/4}$  is a good description in both cases.
- (b) (5%) How does the surface brightness profile along the major axis look like on a (base 10) logarithmic plot?