PHY-765 SS18: Gravitational Lensing. Worksheet Week 8

1 Journal Club #2: Paper selection

Select a paper for the second installment of our journal club.

1.1

Use astro-ph's search engine to get a list of papers posted or updated in the month of May 2018 with "lensing" in the abstract, similar to what you did for Journal Club # 1. Select the paper you find most interesting based on title or abstract and send its URL in an email to kbschmidt@aip.de.

1.2

Read your selected pick and prepare a ∼5 minute overview of the paper (no slides). The 5 minutes are not enough time to get into the glory details of the paper. Use your experience from Journal Club # 1 to make best use of the time, and try to cover the following things in your overview:

- What is the title and who are the main authors of the paper?
- What is the aim of the work?
- What are the main conclusions of the work? Here you can show the main plot (only!) of the paper, if you think this is useful for clarification and getting the point across.
- What is your overall impression of the work? That is, do you see anything that could be improved? Is there (a lack of) clarity about the procedures used? What are the importance of the results seen in the broader picture? etc.

Hence, the overview should be a 'teaser' (with spoilers) of the paper.

The paper overview will be given in class next week

2 The total magnification of a point mass microlens

In the following the expressions of $\theta_\pm$ for a point mass lens described in week 4

$$\theta_\pm = \frac{\beta}{2}\left[1 \pm \sqrt{1 + \frac{4\theta_\mathrm{E}^2}{\beta^2}}\right] \tag{1}$$

and the corresponding magnifications of the individual images described in week 6

$$\mu_\pm = \frac{1}{1 - (\theta_\mathrm{E}/\theta_\pm)^4} \tag{2}$$

will be needed.

2.1

Using this knowledge, show that the sum of the unresolved image's magnification in the point source lens is given by

$$\mu \equiv \mu_+ + |\mu_-| = \frac{y^2 + 2}{y\sqrt{y^2 + 4}} \quad \text{where} \quad y = \frac{\beta}{\theta_\mathrm{E}} \tag{3}$$

2.2

Also show that the ratio of the magnifications is equal to the square of the ratio of the normalized positions, i.e.,

$$\left|\frac{\mu_-}{\mu_+}\right| = \left(\frac{y-\sqrt{y^2+4}}{y+\sqrt{y^2+4}}\right)^2 = \left(\frac{x_-}{x_+}\right)^2 \quad \text{where} \quad x_\pm = \frac{\theta_\pm}{\theta_\mathrm{E}} \tag{4}$$

3 Short Essay on Gravitational Lensing - Continued

Continue working on the essay described in exercise 2 on the worksheet from Week 6.

4 Mid-semester teaching evaluation

As I have mentioned, I'm taking part of a PoGS program on improving University level teaching skills and competences. I would therefore greatly appreciate feedback on the first half of the semester of the course, so I can continue developing and improving my teaching competences. You can give this in a short google questionnaire I put together. Thanks!