Please attach a narrative (not to exceed 4 pages, excluding appendices) addressing the following:

- What are the student learning outcomes? Please provide a numbered list.

1. Graduates of the program are expected to be successful in pursuing careers in the direct practice of astrophysics or further education in more advanced programs in physics or related fields.

2. Graduates of the program are ready to be team contributors or leaders, capable of collaboration and thinking independently.

3. Graduates of the program are trained to be effective communicators (both orally and in the written word) professionally and socially.

4. Graduates of the program are prepared through coursework and cutting-edge research to be professional problem solvers.

5. Graduates are expected to possess the ability to work in the laboratory, understand how to take and analyze experimental data and/or generate
theoretical data, and to have familiarity with practical laboratory equipment such as oscilloscopes, voltmeters, and spectrometers and computers.

Which learning outcomes were assessed?  All outcomes were assessed (1-5).

How were they assessed?  (Programs must use at least one direct assessment of student learning.) Our primary tools of assessment lie in the thesis requirement. The masters candidate presents his/her thesis work in written form (the thesis) and in oral form (the defense). Outcomes 1-5 are assessed during this time. We also conduct an exit interview with all of our students to partially-assess outcome 1 and via subsequent contact with the students after graduation.

Undergraduate programs should assess at least one University Undergraduate Learning Outcome (UULO) each year, which may or may not overlap with a program learning outcome. Not applicable as this is a graduate degree.

Graduate programs should assess at least one outcome related to one of the following graduate level requirements each year:

1. student engagement in research, scholarship, creative expression and/or appropriate high-level professional practice.
2. activities requiring originality, critical analysis and expertise.
3. the development of extensive knowledge in the field under study.

For the masters of science in astronomy degree, we assess outcome 6 in particular and, to a lesser extent, outcomes 7 and 8.

What was learned from the assessment results?

The faculty have made great strides in improving the quality and expectations of the masters in astronomy thesis. We have found that the requirement of graduate students to meet with their thesis committee at least yearly has been very instrumental in identifying potential problems early and help them develop their thesis project and focus on the research problem sooner. As a result, we have observed a reduced average time for our students to complete and defend their masters thesis on average.

From the exit interview data gathered, students have complained about the lack of offerings of important upper-level courses that they need to graduate. This is in part due to a paucity of professors as a number have either retired or passed away. There was also some criticism of the varying level of teaching and supervisory quality with some professors (allegedly) leaving class early (e.g.). As result, some students didn't feel that they learned as much as they should have for some classes. Some students
explained that they like professors who teach via the blackboard rather than powerpoint. Some courses used math which some of students explained that they had not formally had yet. Various textbooks were criticized as being too outdated.

On the positive side, students in general felt that by having significant research experience and exposure as a graduate student, they were well prepared for pursuing further graduate studies (i.e. the Ph.D.) and lifelong learning. All students interviewed felt that their UNLV astrophysics education would help them succeed. In general, the students felt that their UNLV astrophysics graduate education was excellent and were all largely satisfied. We also are developing a tremendous track record of having our students continue on to further their studies via pursuit of the Ph.D. school (both here at UNLV and elsewhere) and/or other training. Most or our students who complete their masters in astronomy degrees go on to the Ph.D. program in astronomy at UNLV or elsewhere. This is an indication of the success we have in training our graduate students.

How did the program respond to what was learned?

The Assessment coordinator has met with the Chair to discuss results of the exit interviews. We have made more efforts encourage our students to apply for research-based internships (e.g. at Los Alamos or Lawrence Livermore National Labs or the local labs such as the Remote Sensing lab) as well as summer school workshops for our graduate students. We feel that the efforts will aid the students in making positive contacts with scientists at these DOE-run facilities which may aid them when later seeking employment.

Physics and astronomy faculty continue to debate the best practices associate with formally training students on public speaking and the process of researching, reading and digesting peer-reviewed papers. The late Prof. Lon Spight taught a one credit graduate-level seminar in the past but has since passed away. Prof. Ashkan Salamat organizes a “Condensed Coffee” for students (mostly from his research group) where the latest state-of-the-art research papers are presented by one of the students (including graduate students) once a week and discussed. Prof. Steffen also organizes a similar seminar for astronomy students which is helpful for them. The problem with these efforts is that they are voluntary and often students don’t participate. We are actively discussing means to encourage student participation in these types of educational events which may include making a new seminar course for credit.

We strongly encourage applying students to take the GRE Physics exam but for a variety of reasons, we have in the past accepted students into the program who had not taken the GRE. With Prof. Victor Kwong (Graduate physics coordinator), we are working to ameliorate this issue. The topic is also frequently discussed among our faculty. We have also learned that in general, the best prepared students are the students who were undergraduate physics majors at UNLV.

Please limit the narrative portion of your report to no more than four pages. You may attach appendices with data, tables, charts, or other materials as needed. Please explain the relevant conclusions from any appendices in your narrative. Please contact the Office of Academic Assessment if you have questions or need assistance.