

NAME: \_\_\_\_\_

Section Number: \_\_\_\_\_

**Homework 9: Saturn, Uranus and Neptune**

**Due:** in your section on **the week of April 14<sup>th</sup>**. Be neat and concise, show your work, and remember units. An answer without the correct units is wrong.

**Suggested reading:** Lecture notes 27, 28, and 29, and chapters 10.2, 7.1, and 11.1.

1. [3 Points] Suppose the material that formed Jupiter came together without any rotation so no “jovian nebula” formed and the planet today wasn’t spinning. How else would the Jovian system be different? List at least THREE effects and explain each in a sentence.
  
  
  
  
  
  
  
  
  
  
2. [2 Points] If Saturn’s rings are not solid, why do they look solid when viewed through a small telescope?
  
  
  
  
  
  
  
  
  
  
3. [2 Points] Describe the seasons on Uranus. Why are the Uranian season different from those on any other planet?

4. [3 Points] Explain why the atmosphere of Neptune has features that are like Jupiter and Saturn while the atmosphere of Uranus is essentially featureless.

5. **Detecting Neptune:**

a. [2 Points] At what planetary configuration is the gravitational force of Neptune on Uranus at a maximum (Draw a picture or describe in words)?

b. [4 Points] For this configuration, calculate the gravitational force exerted by the sun on Uranus and by Neptune on Uranus.

c. [2 Points] By what fraction is the sunward gravitational pull on Uranus reduced by the pull from Neptune?

d. [2 Points] Based on your calculations, do you expect that Neptune has a relatively large or relatively small effect on Uranus's orbit?