

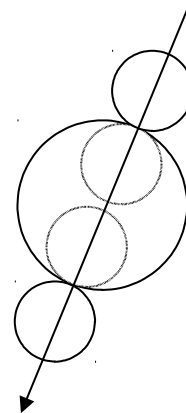
Name _____

Diameters of Pluto and Charon

Because of the orientation of the Pluto-Charon system, every 124 years the plane of Charon's orbit will take it across the disk of Pluto and there will be a series of occultations. This last occurred during the late 1980s. Over the course of several years these occultations went from partial to central to partial again. The photometric data below were recorded during an occultation of Charon by Pluto on 18 Feb 1987, near the middle of the series. In this table, Δmag is the change in the amount of light during the event relative to the amount of light received outside of the occultation. Negative values indicate a decrease in the amount of light. **Plot the light curve for the event**, i.e., the decrease in magnitude as a function of time. Feel free to make the plot by hand or electronically.

First Contact is the point where one object begins to occult the other, Second Contact is when the occultation is total, Third Contact is when the occulted object begins to reappear, and Fourth Contact is when the occultation is over.

From your plot, **determine the times** of 1st, 2nd, and 3rd Contact and **record these times** on the next page. Recent estimates of Charon's orbit suggest that the orbital radius is 19,130 km. Charon's orbit period is 6.387 days. Assuming a circular orbit, **calculate its orbital velocity and record** this value. Using this velocity and the elapsed times determined from the light curve, **calculate the diameters** of Pluto and Charon.



Time (UT)	Δ mag
13:30	-0.010
13:45	-0.001
14:00	+0.012
14:15	-0.011
14:30	-0.033
14:45	-0.050
15:00	-0.097
15:15	-0.128
15:30	-0.155
15:45	-0.180
16:00	-0.218
16:15	-0.220
16:30	-0.221
16:45	-0.219
17:00	-0.220
17:15	-0.199
17:30	-0.150
17:45	-0.130
18:00	-0.092
18:15	-0.049
18:30	-0.024
18:45	-0.005
19:00	-0.006
19:15	-0.002
19:30	-0.001

Time of 1st Contact: _____

Time of 2nd Contact: _____

Time of 3rd Contact: _____

Charon's orbital velocity in km/h: _____

Pluto's diameter in km: _____

Charon's diameter in km: _____

Month / year the occultations began: _____

Month / year the occultations ended: _____

The 18 Feb 1987 event was *non-central*. How does the non-centrality of the occultation path affect your estimate of Pluto's diameter?