NAME(S) ___________________________ SECTION DAY/TIME______
ASTRONOMY 20/25 S. V. LLOYD

STELLARIUM ACTIVITY #1: STARRISE AND STARSET

Overview

The **sidereal day** is the amount of time from starrise to the next starrise. In this activity, you will measure the length of the sidereal day. You will also learn that the amount of time from starrise to star set depends on how far the star is from the celestial equator, its **declination.**

Software

This project is written for **Stellarium** version **0.16.0**. See the handout entitled "Stellarium" for using the program and adjusting basic settings.

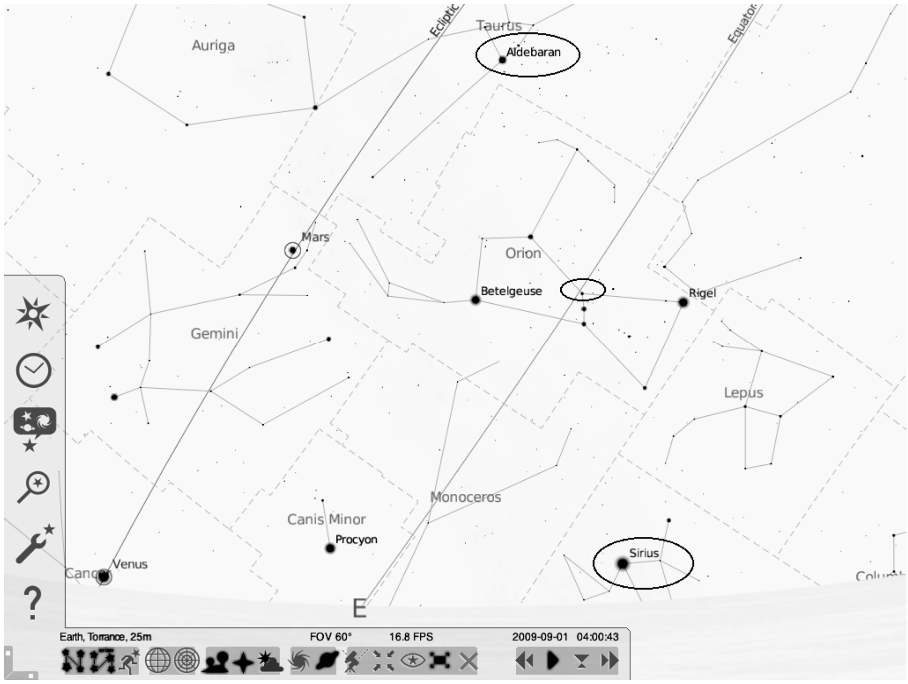
Configuration

Adjust the settings as shown in the Stellarium handout. Make sure you are using the **Ocean** “landscape” and that your location is **Torrance**.

Check that your FOV (field of view) is about 60° —it's displayed at the bottom of the screen. If not, zoom in or out until your FOV is about 60°. To zoom, use the page-up and page-down keys.

Make sure the atmosphere is off; if the sky is bright during the daytime, press [A].

Stop the clock by hitting [7]. Open the **Date/time window** [F5]. Set the date to **July 1** (the year doesn't matter). Set the time to **7:00:00**. That’s 7 a.m.



Find the stars

Press the left arrow key until you are facing east. You should see the star **Procyon** just above the **E** and **Sirius** a bit to the right and just above the horizon. (If not, advance time one hour.) Above Sirius are three stars in a vertical row forming the belt of **Orion**. The star at the upper end of the belt is **Mintaka**. (The star in the middle is **Alnilam.)** Click on it to make sure you've found the right star. Now look above for the reddish star **Aldebaran** in Taurus. (It may be hidden by the writing.)

Starrise and Starset

Click on Aldebaran to select it. Look for its **declination** in the info in the upper left. Declination is how far north or south of the celestial equator the star is. It is the number at the end of the info line labeled "**RA/DE (J2000.00)**." The declination will be in the form 12° 34' 56". That means 12 degrees, 34 minutes, 56 seconds. (There are 60 minutes in a degree and 60 seconds in a minute.) It will start with either "+" or "-"; "+" means the star is north of the celestial equator; "-" means the star is south of the celestial equator. Record the declination in the table on the next page. Round off to the **nearest degree**. Be sure to write either + or -.

"Round off" means to drop the minutes and seconds. If the minutes are greater than **30**, increase the degrees by one degree.

Make time go backwards until Aldebaran is right on the horizon. You can get more precise time control by holding down the shift key while using the time controller. Stop time when Aldebaran is on the horizon (hit [7]). This is the minute that Aldebaran rises on July 1. Record the time in the table. Round off the time to the **nearest minute**. Note that the rise time goes *under* the set time in the table. This will make it easier to subtract later on.

Now make time go forward until Aldebaran sets in the west. Use the arrow keys to keep Aldebaran in view. Record the setting time (round off to the **nearest minute**).

Repeat for **Mintaka** and **Sirius**.

Repeat for August 1 and September 1.

ALDEBARAN

	July 1	Aug. 1	Sept. 1
Declination			
Set time			
Rise time			
Time above horizon			

MINTAKA

	July 1	Aug. 1	Sept. 1
Declination			
Set time			
Rise time			
Time above horizon			

SIRIUS

	July 1	Aug. 1	Sept. 1
Declination			
Set time			
Rise time			
Time above horizon			

Time above Horizon

Calculate the time each star spends above the horizon by subtracting the rise time from the set time. You will have to do the subtracting manually, because calculators don't know how to deal with times. If you have to borrow an hour when subtracting, remember that you are borrowing 60, not 10, because there are 60 minutes in an hour, not 10 minutes. Double-check your answer by adding the answer to the starrise time; you should get the starset time.

Do NOT try to do this on a calculator! If you do, you will get the wrong answer. Make sure the minutes are **less than 60.**

Example 1: Rise time **6:45**; set time **17:25**.

Step 1

$$\begin{array}{r} 1\,7:2\,5 \\ \underline{-\ 6:4\,5} \end{array}$$

Step 2

$$\begin{array}{r} 1\,\cancel{7}^{6}:\cancel{2}^{8}5 \\ \underline{-\ 6:4\,5} \\ 1\,0:4\,0 \end{array}$$

Example 2: Rise time **4:34**; set time **15:22**.

Step 1

$$\begin{array}{r} 1\,5:2\,2 \\ \underline{-\ 4:3\,4} \end{array}$$

Step 2

$$\begin{array}{r} 1\,\cancel{5}^{4}:\cancel{2}^{8}\,2 \\ \underline{-\ 4:3\ \ 4} \end{array}$$

Step 3

$$\begin{array}{r} 1\,4:\cancel{8}^{7}\,\cancel{2}^{12} \\ \underline{-\ 4:3\ \ 4} \\ 1\,0:4\ \ 8 \end{array}$$

If the set time is *earlier* than the rise time because the star sets on the next day, add 24 hours to the set time before subtracting.

[Continue to next page.]

Analysis

1. *What happens to a star's declination as time goes by?*

2. *As the months go by, do the stars rise and set earlier, later or at the same time?*

3. *How much does the rise time change every month?*

4. *For a given star, how does the time spent above the horizon change from month to month?*

5. *Write a paragraph explaining how the amount of time a star spends above the horizon depends on its declination.* What is the pattern?

[15 Sept. 2017]