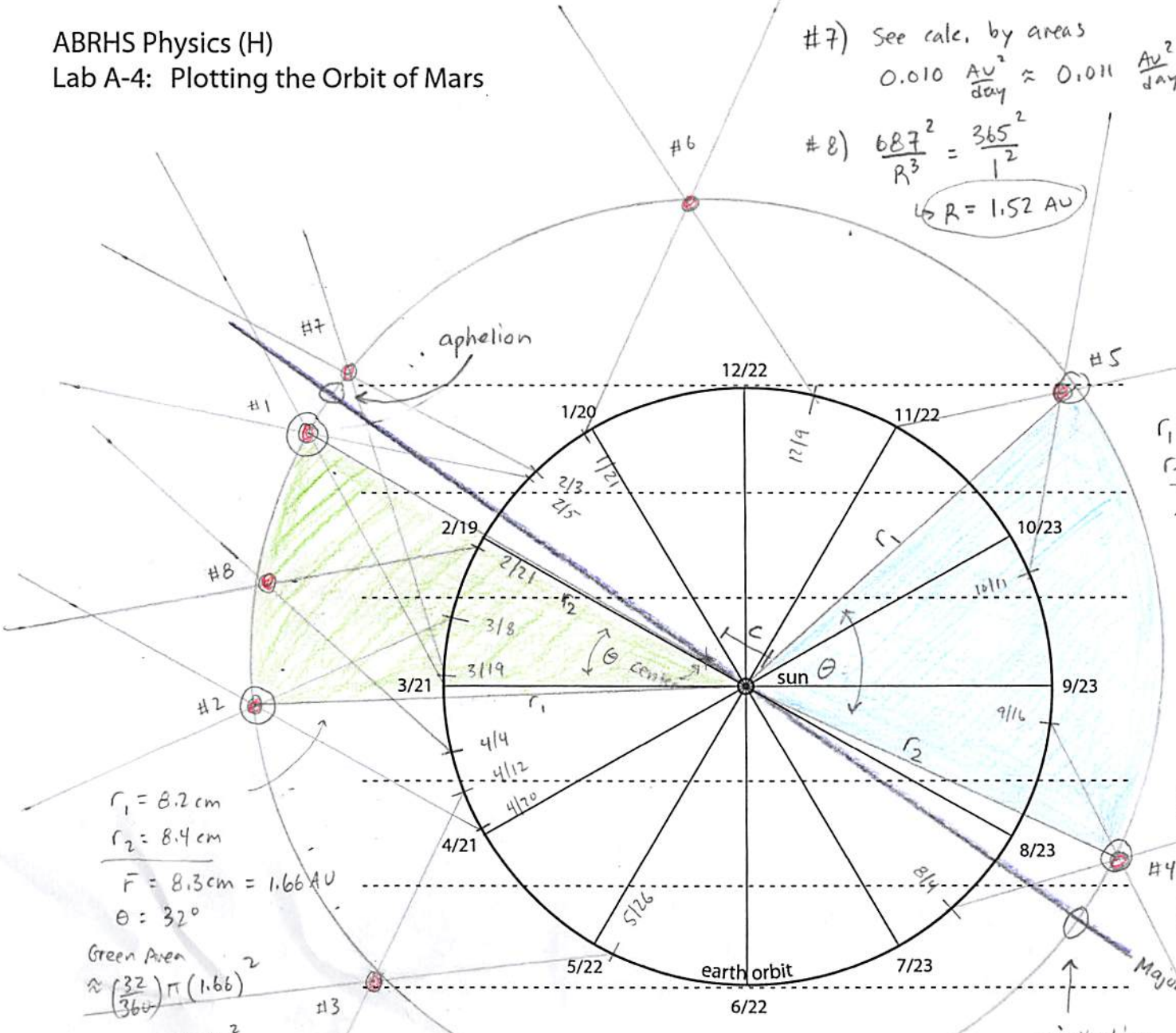
ABRHS Physics (H)
Lab A-4: Plotting the Orbit of Mars

Name: KEY

#7) See calc. by areas
$0.010 \frac{AU^2}{day} \approx 0.011 \frac{AU^2}{day}$

#8) $\frac{687^2}{R^3} = \frac{365^2}{1^2}$
$\Rightarrow R = 1.52$ AU



	Date	To Mars	
1	Mar 21, 1931	118.5	
	Feb. 5, 1933	169	
2	Apr. 20, 1933	151.5	
	Mar. 8, 1935	204.5	24.5
3	May 26, 1935	187	
	Apr. 12, 1937	245.5	64.5
4	Sept. 16, 1939	297	117
	Aug. 4, 1941	16.5	
5	Nov. 22, 1941	12	
	Oct. 11, 1943	80	
6	Jan. 21, 1944	65.5	
	Dec. 9, 1945	123	
7	Mar. 19, 1946	107.5	
	Feb. 3, 1948	153	
8	Apr. 4, 1948	138	
	Feb. 21, 1950	190.5	

$r_1 = 7.3$ cm
$r_2 = 6.7$ cm
$\bar{r} = 7$ cm
$= 1.4$ AU
$\theta = 68°$

Blue Area
$= \left(\frac{68}{360}\right)\pi(1.4)^2$
$= 1.16$ AU^2

Aug 4 → Nov 22 = 27 + 30 + 31 + 22 = 110 days

$\frac{dA}{dt} = \frac{1.16}{110}$

$\frac{dA}{dt} = 0.011$ AU^2/day

$r_1 = 8.2$ cm
$r_2 = 8.4$ cm
$\bar{r} = 8.3$ cm $= 1.66$ AU
$\theta = 32°$

Green Area
$\approx \left(\frac{32}{360}\right)\pi(1.66)^2$
$= 0.77$ AU^2

Feb 5 → April 20 =
23 + 31 + 20 =
= 74 days

$\frac{dA}{dt} = \frac{0.77}{74} = 0.010$ AU^2/day

Scale: 5 cm = 1 AU

R: 7.55 cm = 1.51 AU
c: .80 cm = .16 AU
p: 6.7 cm = 1.34 AU
a: 8.4 cm = 1.68 AU

$e = \frac{.80}{7.55} = 0.106$

Mars-Earth Distances:

min: 1.7 cm = .34 AU
max: 13.5 cm = 2.7 AU

Mark on orbit: Major Axis, center, perihelion, aphelion, closest approach, farthest approach