

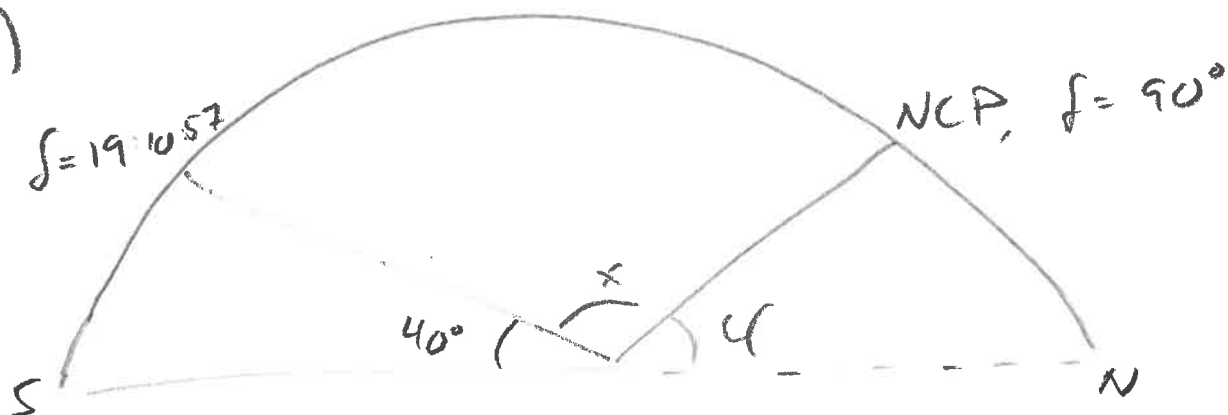
ASTR 469

HW #3

1)  $(RA, Dec) = (14:15:39.7, 19:10:57)$

a) Rises ~4m earlier each night, so  
8:48 pm

b)



Solve for angle  $x$ :

$$x = 90^\circ - 19:10:57 = 90 - \left(19 + \frac{10}{60} + \frac{57}{3600}\right)$$
$$= 70.8175^\circ$$

Altitude of NCP is latitude, so

$$\varphi = 180 - 40 - 70.8175 = 69.1825^\circ$$

c) When transiting,  $HA = 0$ , so  $LST = RA$   
 $= 14:15:39.7$

d) Deneb will transit later than Arcturus,

$$\text{so } HA = 14:15:39.7 - 20:40:00 = -6.406^h$$



2) Keck:  $19.83, -155.47$

Gemini S:  $-30.24, -70.47$

a) Can see  $\delta < (90 - \varphi)$

so  $\delta < (90 - 30.24)$

$\delta < 59.76^\circ$

b) Can see  $\delta > (\varphi - 90)$

$\delta > (19.83 - 90)$

$\delta > -70.17^\circ$

c) RA =  $83.633$

=  $5.5755^h$

S:  $34:31.8$

$0.5755 \times 60 = 34.53$

$0.53 \times 60 = 31.8$

Dec  $22.015$

$0.015 \times 60 = 0.9$

$0.9 \times 60 = 54$

$22^\circ 0' 54''$

d) S:  $34:31.8$

e)  $\alpha = 0$

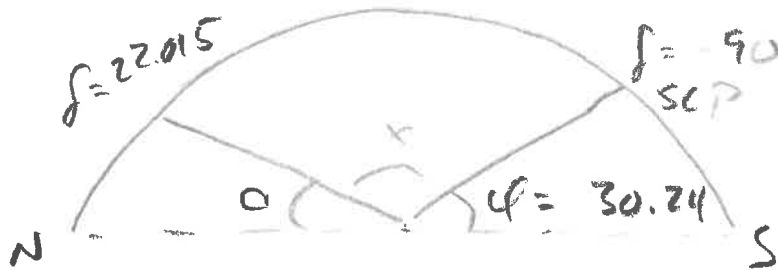
$$\sin(\alpha) = \sin(\delta) \sin(\varphi) + \cos(\delta) \cos(\text{HA}) \cos(\varphi)$$

$$\cos(\text{HA}) = \frac{-\sin(\delta) \sin(\varphi)}{\cos(\delta) \cos(\varphi)} = 0.296$$

$$\Rightarrow HA = 76.37^\circ = 5.09h$$

a)  $10.18h$

g)



$$x = 22.015^\circ + 90^\circ = 112.015^\circ$$

$$a = 180 - 112.015 - 30.24 = 37.745^\circ$$

or

$$\sin(a) = \sin(\delta) \sin(\varphi) + \cos(\delta) \cos(\varphi) \cos(HA)$$

$$HA = 0$$

$$a = \sin^{-1}(\sin(\delta) \sin(\varphi) + \cos(\delta) \cos(\varphi))$$

$$= 37.745^\circ$$

h)  $X = \sec(a) = \sec(52.255^\circ) = 1.64$

i) On 3/20 (vernal equinox),  $RA_0 = 0h$

Want 17:34. Advances  $\sim 2h/month$ ,

$$\text{so } \frac{17:34}{2} \sim 8.75 \text{ months}$$

3/20 + 8mo + 3weeks  $\sim$  mid-December

j) For Dec. 15, I get  $4.81^h$   
not bad!

k)  $RA_{PI} = 56.75 = 3.78^h$

$$HA = LST - RA = 1.03^h$$

l) Nad  $HA > 1.5^h$  when setting

Also, high altitude transits are better



3) a) Assume latitude =  $+40^\circ$

$$\delta < \varphi - 90^\circ \Rightarrow \delta < -50^\circ \text{ never visible}$$

b)  $\delta = -10^\circ, \varphi = 40^\circ$

$$\sin(\alpha) = \sin(\delta) \sin(\varphi) + \cos(\delta) \cos(HA) \cos(\varphi)$$

set  $\alpha = 0$ , solve for HA

$$\cos(HA) = \frac{-\sin(\delta) \sin(\varphi)}{\cos(\delta) \cos(\varphi)} = 0.147$$

$$\Rightarrow HA = 1.42 \text{ rad} = 81.4^\circ = 5.42^h$$

Total time is twice this so  $10.84^h$

c) i)  $(\ell, b) = (0, 0) \Rightarrow RA \ 17:45:37.2$

$$Dec \ 28:56:10.2$$

ii)  $(RA, Dec) = (0, +90^\circ) \Rightarrow \ell = 122.4^\circ$

$$b = 27.1^\circ$$

iii) see figure

