Solution to Problem 103

The zenith angles $62^\circ 16'40"$, $80^\circ 40'50"$ and $46^\circ 23'50"$ yield all of the angles in the triangle T-S-F:

- Angle $F = 80^\circ 40'50" + 46^\circ 23'50" = 127^\circ 04'40"
- Angle $S = 180^\circ - 62^\circ 16'40" - 80^\circ 40'50" = 37^\circ 02'30"
- Angle $T = 180^\circ -$ angle $F -$ angle $S = 52^\circ 52'50"

With known side F-S as 110.14', side T-F is found by the Law of Sines to be 242.47'

Side T-F times the cosine of $46^\circ 23'50"$ yields 167.22', the height of the top above F.

Likewise, the zenith angles $118^\circ 54'00"$, $109^\circ 37'30"$ and $80^\circ 40'50"$ yield the angles of triangle B-F-S:

- Angle $S = 109^\circ 37'30" - 99^\circ 19'10" = 10^\circ 18'20"
- Angle $F = 360^\circ - 118^\circ 54'00" - 80^\circ 40'50" = 160^\circ 25'10"
- Angle $B = 180^\circ -$ angle $S -$ angle $F = 9^\circ 16'30"

With known side F-S being 110.14', side F-B is found by the Law of Sines to be 122.25'

Side B-F times the cosine of $61^\circ 06'00"$ gives 59.08' as the distance from point F to the bottom of the cliff.

The total height is $167.22' + 59.08' = 226.3'$
Solution to Problem 104

Again, the zenith angles $62^\circ 16'40''$, $80^\circ 40'50''$ and $46^\circ 23'50''$ yield all of
the angles in the triangle T-S-F:
Angle $F = 80^\circ 40'50'' + 46^\circ 23'50'' = 127^\circ 04'40''$
Angle $S = 180^\circ - 62^\circ 16'40'' - 80^\circ 40'50'' = 37^\circ 02'30''$
Angle $T = 180^\circ - \text{angle } F - \text{angle } S = 52^\circ 52'50''$
With known side F-S as 110.14', side T-F is found by the Law of Sines to
be 242.47'
Side T-F times the cosine of $(90^\circ - 46^\circ 23'50'')$ yields 175.58', the
horizontal distance from the top of the cliff to point $F$.

Again, the zenith angles $118^\circ 54'00''$, $109^\circ 37'30''$ and $80^\circ 40'50''$ yield the
angles of triangle B-F-S:
Angle $S = 109^\circ 37'30'' - 99^\circ 19'10'' = 10^\circ 18'20''$
Angle $F = 360^\circ - 118^\circ 54'00'' - 80^\circ 40'50'' = 160^\circ 25'10''$
Angle $B = 180^\circ - \text{angle } S - \text{angle } F = 9^\circ 16'30''$
With known side F-S being 110.14', side F-B is found by the Law of Sines
to be 122.25'
Side B-F times the cosine of $(90^\circ - 61^\circ 06'00'')$ gives 107.03' as the
horizontal distance from point $F$ to the bottom of the cliff.

The difference from $F$ to $T$ and from $F$ to $B$ is $175.58' - 107.03' = 68.55'$,
the amount the cliff recedes as it rises.

The slope of the wall is 68.55' to 226.3' or 3.3:1