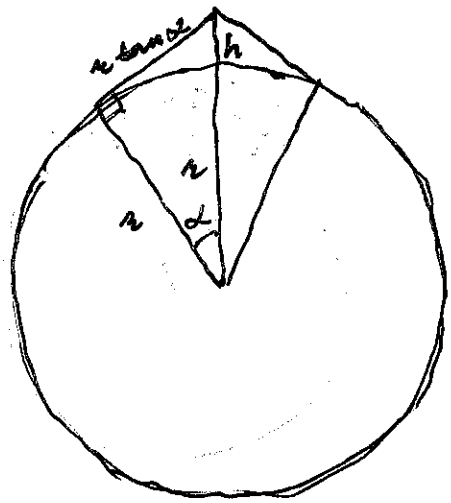

length of cord $\quad l = 2\pi r + \varepsilon$, where $\varepsilon = 1$ yard

but also $\quad l = (2\pi - 2\alpha) r + 2 r \tan\alpha$

hence $\quad 2\pi r + \varepsilon = (2\pi - 2\alpha) r + 2 r \tan\alpha$

$$\tan\alpha - \alpha = \frac{\varepsilon}{2r}$$

$$\alpha + \frac{\alpha^3}{3} + 2\frac{\alpha^5}{15} + \ldots - \alpha = \frac{\varepsilon}{2r}$$

ignore α^5 and higher orders

$$\alpha^3 = \frac{3\varepsilon}{2r}$$

now $\quad \cos\alpha = \frac{r}{r+h} \Rightarrow h = \frac{1-\cos\alpha}{\cos\alpha} r = \{\alpha \text{ small}\} \approx (1-\cos\alpha) r$

$$h = \left(1 - \left(1 - \frac{\alpha^2}{2} + \frac{\alpha^4}{24} - \ldots\right)\right) r = \left\{\begin{matrix}\text{ignore } \alpha^4 \\ \text{and higher}\end{matrix}\right\} \approx \frac{\alpha^2 r}{2}$$

yielding $\quad h = \left(\frac{3\varepsilon}{2r}\right)^{2/3} \frac{r}{2} = \left(\frac{3\varepsilon r^{1/2}}{2}\right)^{2/3} \cdot \frac{1}{2} = \left\{\begin{matrix} r = 6378 \cdot 10^3 \text{ m} \\ \varepsilon = 0.9144 \text{ m}\end{matrix}\right\} =$

$$= \left|\begin{matrix} 6.8047 \\ 3.4024 \\ 9.9611 \\ 0.1761 \\ \hline 3.5396 \\ 2.0792 \\ 2.3598 \\ 0.3010 \\ \hline 2.0588 \\ 9.9611 \\ \hline 2.0977 \end{matrix}\right| \begin{matrix} \\ \\ \\ \\ \\ \\ \\ \\ = 114.5 \text{ m} \\ \\ \\ = 125 \text{ yds} \end{matrix}$$