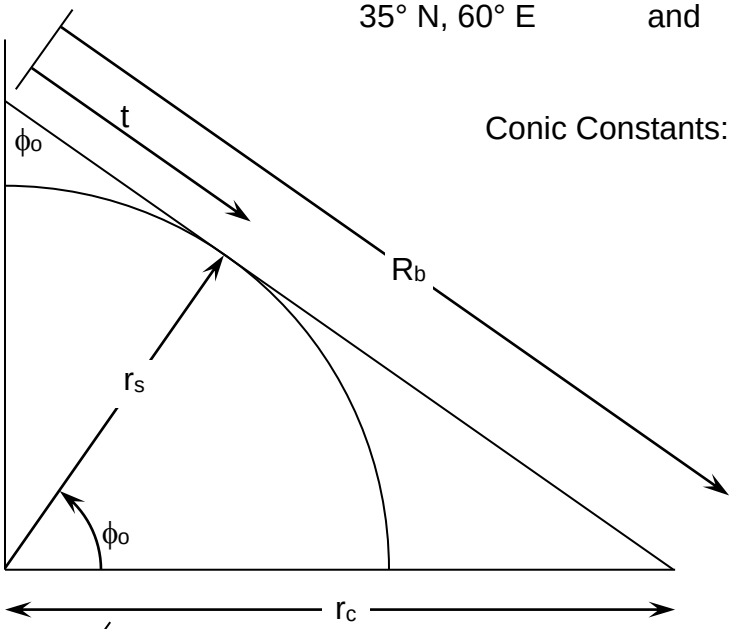
TANGENT CONE

1. Given a sphere of radius 10 and a projection cone tangent to that sphere at latitude 55° North. Use 0° longitude as the central meridian and its intersection with the projection of the equator as the origin for the rectangular coordinates.

   On the developed cone, plot the location of the following points and compute their rectangular coordinates:

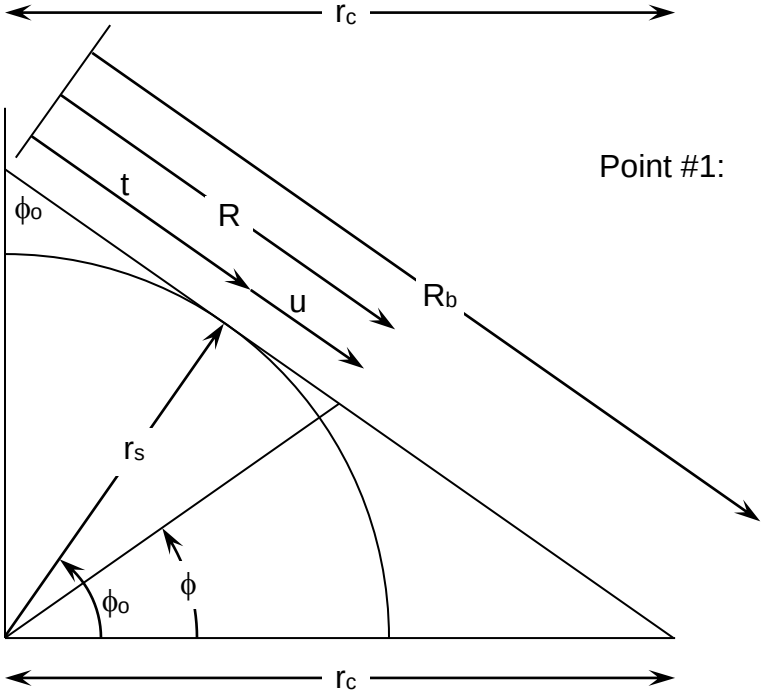
   35° N, 60° E and 70° N, 125° W



Conic Constants:

$r_s = 10.0000$
$\phi_o = +55°$
$\lambda_o = 0°$

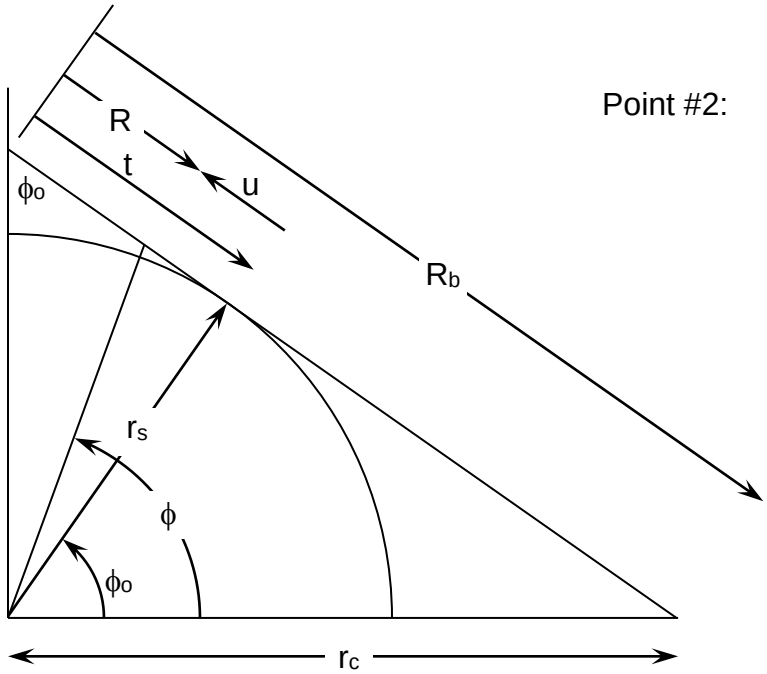
$r_c = r_s / \cos(\phi_o) = 17.4345$
$r_c / R_b = \sin(\phi_o) = 0.8192$
$\alpha = 360° \sin(\phi_o) = 294.8947°$
$R_b = r_c / \sin(\phi_o) = 21.2836$
$t = r_s / \tan(\phi_o) = 7.0021$



Point #1:

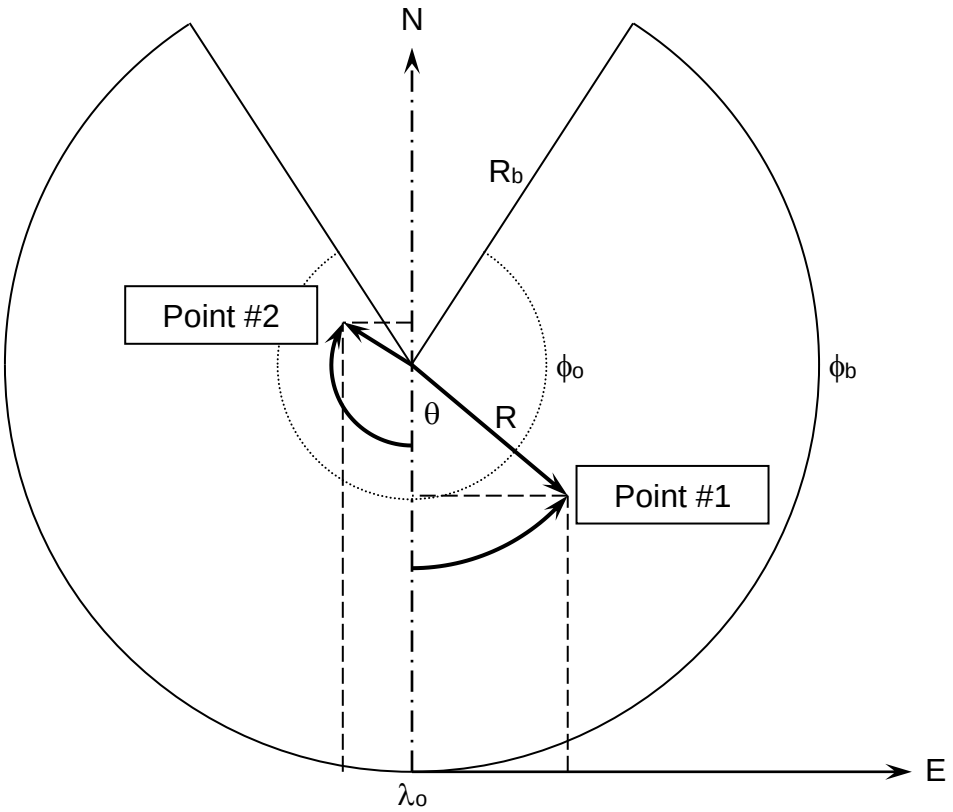
$\phi = +35°$
$\lambda = -60°$

$u = r_s \tan(\phi_o - \phi) = 3.6397$
$R = t+u = 10.6418$
$\theta = (\lambda_o - \lambda) \sin(\phi_o) = 49.1491°$
$N = R_b - R \cos(\theta) = 14.3228$
$E = R \sin(\theta) = 8.0496$



Point #2:

$$\begin{aligned}
\phi &= +70° \\
\lambda &= +125° \\
u &= r_s \tan(\phi_o - \phi) = -2.6795 \\
R &= t + u = 4.3226 \\
\theta &= (\lambda_o - \lambda)\sin(\phi_o) = -102.3940° \\
N &= R_b - R\cos(\theta) = \underline{22.2113} \\
E &= R\sin(\theta) = \underline{-4.2218}
\end{aligned}$$

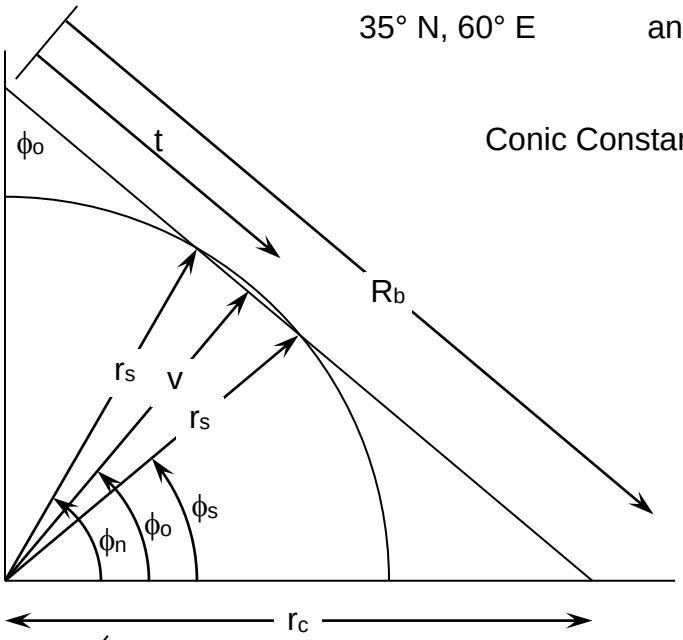


SECANT CONE

2. Given a sphere of radius 10 and a projection cone secant to that sphere at latitudes 40° and 60° North. Use 0° longitude as the central meridian and its intersection with the projection of the equator as the origin for the rectangular coordinates.

   On the developed cone, plot the location of the following points and compute their rectangular coordinates:

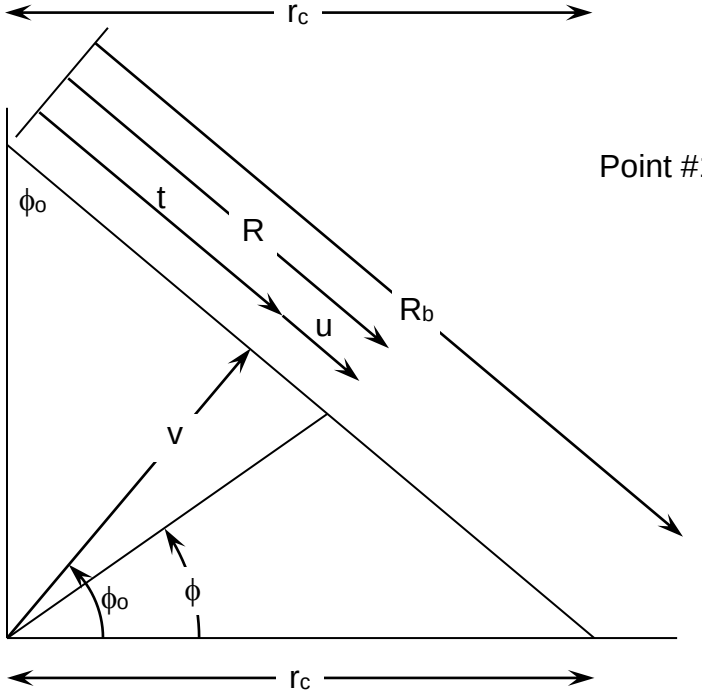
35° N, 60° E and 70° N, 125° W



Conic Constants:

$r_s = 10.0000$
$\phi_s = +40°$
$\phi_n = +60°$
$\lambda_o = 0°$

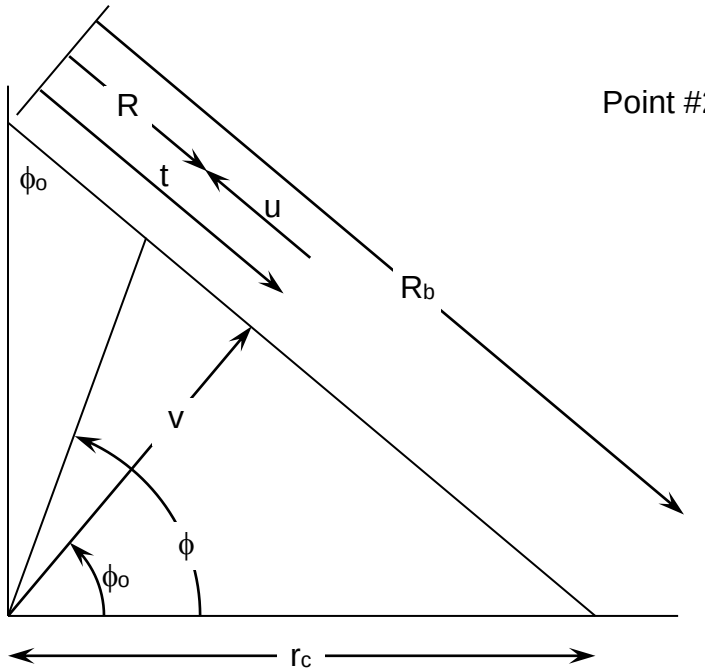
$\phi_o = (\phi_n + \phi_s)/2 = +50°$
$v = r_s \cos(\phi_o - \phi_s) = 9.8481$
$r_c = v / \cos(\phi_o) = 15.3209$
$r_c / R_b = \sin(\phi_o) = 0.7660$
$\alpha = 360° \sin(\phi_o) = 275.7760°$
$R_b = r_c / \sin(\phi_o) = 20.0000$
$t = v / \tan(\phi_o) = 8.2635$



Point #1:

$\phi = +35°$
$\lambda = -60°$

$u = v \tan(\phi_o - \phi) = 2.6388$
$R = t+u = 10.9023$
$\theta = (\lambda_o - \lambda) \sin(\phi_o) = 45.9627°$
$N = R_b - R \cos(\theta) = \underline{12.4215}$
$E = R \sin(\theta) = \underline{7.8375}$



Point #2:

$$\begin{cases} \phi = +70° \\ \lambda = +125° \end{cases}$$

u	=	v $\tan(\phi_o-\phi)$	=	–3.5844
R	=	t+u	=	4.6791
θ	=	$(\lambda_o-\lambda)\sin(\phi_o)$	=	–95.7556°
N	=	R_b–R $\cos(\theta)$	=	20.4692
E	=	R $\sin(\theta)$	=	–4.6555