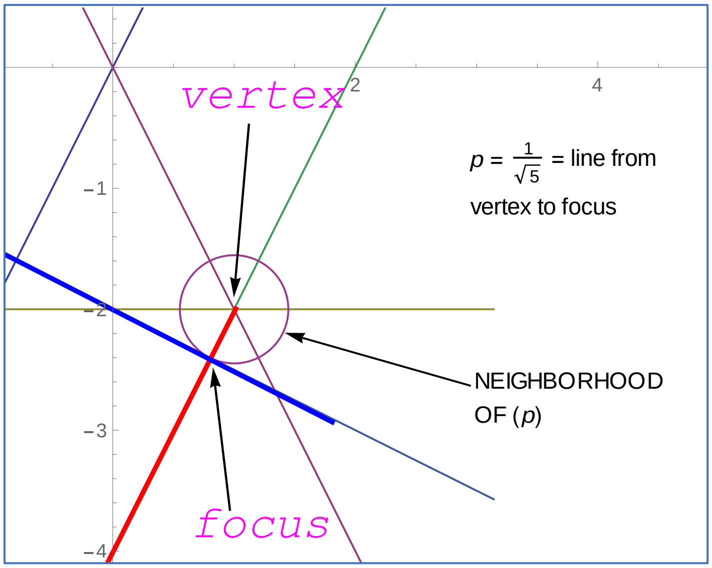
Constructing initial focal radii

STEP 5. Next we determine how far the vertex is from the parabola section focus which is the initial focal radius by constructing the neighborhood of (*p*).

SBG Theorem: That line from the section focus to the curve's vertex will be the curve's initial focal radius (p) and have magnitude $\left(\frac{A}{m^2\sqrt{\frac{1+m^2}{m^2}}}\right)$ where (A = altitude) and (m = cone slope). $\frac{2}{4\sqrt{\frac{5}{4}}} \xrightarrow{yields} \frac{1}{\sqrt{5}} = \{\frac{1}{\sqrt{5}}\text{Cos}[t] + 1, \frac{1}{\sqrt{5}}\text{Sin}[t] - 2\}$

Neighborhood of (p) centered around vertex:

$$\text{ParametricPlot}[\{\{t, 2t\}, \{t, -2t\}, \{t, -2\}, \{t, -4 + 2t\}, \{t, \frac{1}{2}(-4 - t)\}, \{\frac{1}{\sqrt{5}}\text{Cos}[t] + 1, \frac{1}{\sqrt{5}}\text{Sin}[t] - 2\}\}, \{t, -\pi, \pi\}, \text{PlotRange} \to \{\{-2, 6\}, \{\frac{-9}{2}, \frac{1}{2}\}\}]$$



With the section vertex location known, we can construct the "neighborhood of (p)". Where the neighborhood meets the principal and focal axis will lie the section latus rectum (4p) into and out of the paper. The focus of the apollonian section is center to focal chord latus rectum. the value of (p), the sections initial focal radius, will run 2(p) +/- each way, into and out of the paper.

Figure 1: Constructing the neighborhood of (p).

DEMONSTRATION : let control curve be radius3. construct osculating curve for event $\left(4, \frac{5}{3}\right)$ on dependent curve $\left\{t, \frac{t^2}{-12}+3\right\}$

Sand Box Geometry focal radius ID for osculating abscissa : $\frac{(\text{event (radius)})^3}{(2\, r \text{ of control curve})^2}$

$-\frac{4^3}{6^2} = = -\frac{16}{9}$

since we know osculating radius of curvature and abscissa we can find ordinate pair.

$4 - \left(\frac{-16}{9}\right) = \frac{52}{9}$ and $\frac{5}{3} - (-7) = \frac{26}{3}$

$\sqrt{\left(\frac{26\sqrt{13}}{9}\right)^2 - \left(\frac{52}{9}\right)^2}$

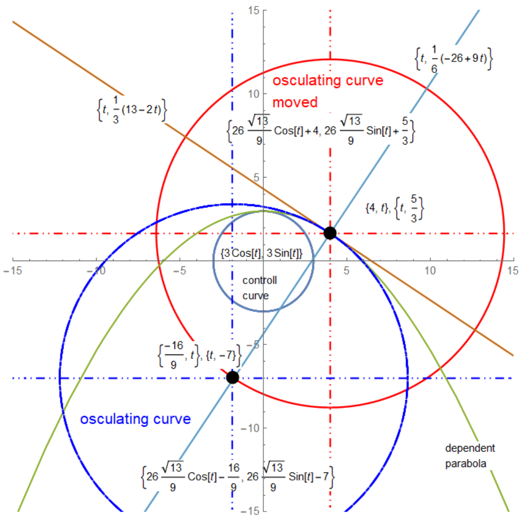
$\frac{26}{3}$

balance accounting by looking at construction map and (*initial - final*) for each (abscissa and ordinate).

$\frac{5}{3} - \frac{26}{3}$

-7

ParametricPlot$\left[\left\{\{3\,\text{Cos}[t], 3\,\text{Sin}[t]\}, \left\{t, \frac{t^2}{-12}+3\right\}, \{4, t\}, \left\{t, \frac{5}{3}\right\}, \left\{26\frac{\sqrt{13}}{9}\text{Cos}[t]+4, 26\frac{\sqrt{13}}{9}\text{Sin}[t]+\frac{5}{3}\right\}, \left\{t, \frac{1}{3}(13-2t)\right\}, \left\{t, \frac{1}{6}(-26+9t)\right\},\right.\right.$
$\left.\left.\left\{26\frac{\sqrt{13}}{9}\text{Cos}[t]-\frac{16}{9}, 26\frac{\sqrt{13}}{9}\text{Sin}[t]-7\right\}, \left\{\frac{-16}{9}, t\right\}, \{t, -7\}\right\}, \{t, -12\pi, 12\pi\}, \text{PlotRange}\to\{\{-15, 15\}, \{-15, 15\}\}\right]$



CENTER of CURVATURE

Google Circle and Radius of Curvature and open;

math.fullerton.edu/mathews/n2003/curvaturemod.html

At end of article is where I found differential geometry location for osculating center.

Center of radius of curvature (osculating)

Dr Matthew method to find abscissa:
a[x]=x-(f'(x))/(f "(x))-((f' (x)^3)/(f "(x)))

Dr Mathew method to find ordinate:
b[x]=f[x]+1/(f "[x])+(f'[x]^2)/(f "[x])