SPIRAL CURVE - STATION - OFFSET
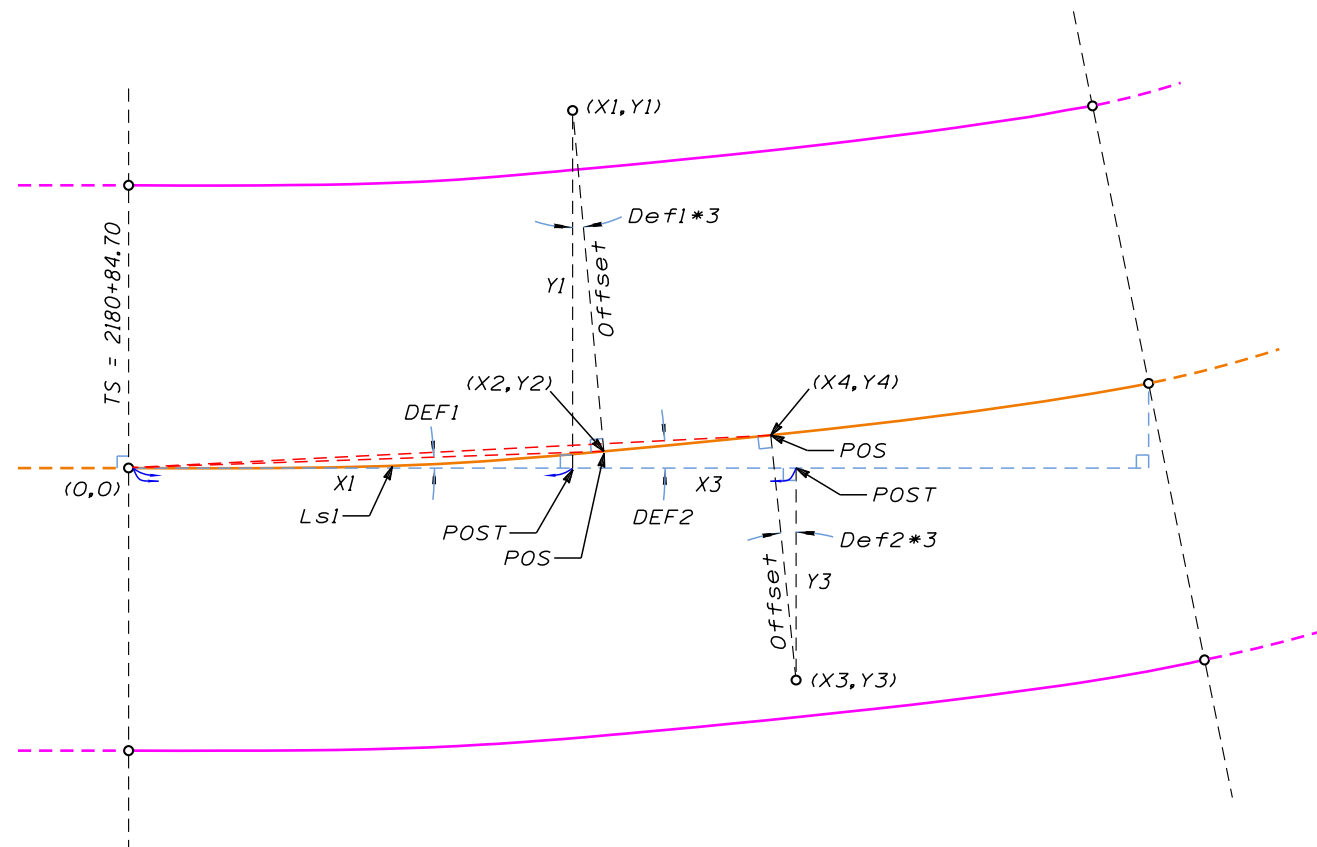

STATION - OFFSET
Not to scale

FORMULAS

Given: TS(Sta) = 2180+84.70; X = 0, Y = 0; X1 = 94.500, Y1 = 110.400;
Ls = 200'; D = 2°00'00"; a = 1.000

__P.O.S.T.__
Sta = TS + X1; Offset = Y1

__P.O.S.__
Begin Iteration
Starting values: Ls1 = 200', Tolerance = 0.0001

$C = Ls1 - (0.00034 * a^2 * (Ls1 / 100)^5)$
$DEF1 = (a * Ls1^2) / 60000$
$X2 = C * Cos(DEF1)$
$Y2 = C * Sin(DEF1)$

$Xdiff = X2 - X1$
$Ydiff = Y2 - Y1$
$Check\ \Delta = ArcTan(Xdiff / Ydiff)$

If Def1 * 3 = Check Δ then solution found
If no solution found then Ls1 = Ls1 - Tolerance.
Repeat iteration with new Ls1 until solution found.

$Sta = TS + Ls1$
$Offset = \sqrt{Xdiff^2 + Ydiff^2}$

__Solution__
2180+84.70 + 94.50 =
2181+79.20 (P.O.S.T.)
110.40 LT

Ls1 = 95.37476   C = 95.37479
DEF1 = 0.15161° or 00°09'05.8"
X2 = 95.37446
Y2 = 0.25236

Xdiff = 0.87446
Ydiff = -110.14764

0.45482 - 0.45486 = -0.00004
less than 0.0001 (Tolerance)
Solution found

2180+84.70 + 95.37 =
2181+80.07 (P.O.S.)

$\sqrt{0.87446^2 + (-110.14764)^2}$
= 110.15 (Offset LT)

OFFSET - LEFT SIDE

FORMULAS

Given: TS(Sta) = 2180+84.70; X = 0, Y = 0; X1 = 94.500, Y1 = 110.400; X3 = 125.400, Y3 = -80.500
Ls = 200'; D = 2°00'00"; a = 1.000

__P.O.S.T.__
Sta = TS + X1 and TS + X3; Offset = Y1 and Y3

__P.O.S.__
Begin Iteration
Starting values: Ls1 = 200', Tolerance = 0.0001

$C = Ls1 - (0.00034 * a^2 * (Ls1 / 100)^5)$
$DEF1\ or\ DEF2 = (a * Ls1^2) / 60000$
$X2\ or\ X4 = C * Cos(DEF1\ or\ DEF2)$
$Y2\ or\ Y4 = C * Sin(DEF1\ or\ DEF2)$

$Xdiff = X2 - X1\ or\ X4 - X3$
$Ydiff = Y2 - Y1\ or\ Y4 - Y3$
$Check\ \Delta = ArcTan(Xdiff / Ydiff)$

If Def1 * 3 or Def2 * 3 = Check Δ then solution found
If no solution found then Ls1 = Ls1 - Tolerance.
Repeat iteration with new Ls1 until solution found.

The solution is best found by utilizing a computer program to run the iterations.

$Sta = TS + Ls1;\ Offset = \sqrt{Xdiff^2 + Ydiff^2}$

CENTERLINE SPIRAL STATION-OFFSET

FORMULAS

Given: TS(Sta) = 2180+84.70; X = 0, Y = 0; X3 = 125.400, Y3 = -80.500;
Ls = 200'; D = 2°00'00"; a = 1.000

__P.O.S.T.__
Sta = TS + X3; Offset = Y3

__P.O.S.__
Begin Iteration
Starting values: Ls1 = 200', Tolerance = 0.0001

$C = Ls1 - (0.00034 * a^2 * (Ls1 / 100)^5)$
$DEF2 = (a * Ls1^2) / 60000$
$X4 = C * Cos(DEF2)$
$Y4 = C * Sin(DEF2)$

$Xdiff = X4 - X3$
$Ydiff = Y4 - Y3$
$Check\ \Delta = ArcTan(Xdiff / Ydiff)$

If Def2 * 3 = Check Δ then solution found
If no solution found then Ls1 = Ls1 - Tolerance.
Repeat iteration with new Ls1 until solution found.

$Sta = TS + Ls1$
$Offset = \sqrt{Xdiff^2 + Ydiff^2}$

__Solution__
2180+84.70 + 125.400 =
2182+10.10 (P.O.S.T.)
80.50 RT

Ls1 = 124.31152 C = 124.30807
DEF2 = 0.25754° or 00°15'27.1"
X4 = 124.30682
Y4 = 0.55877

Xdiff = -1.09318
Ydiff = 81.05877

0.77263 - 0.77266 = -0.00004
less than 0.0001 (Tolerance)
Solution found

2180+84.70 + 124.31 =
2182+09.01 (P.O.S.)

$\sqrt{(-1.09318)^2 + 81.05877^2}$
= 81.07 (Offset RT)

OFFSET - RIGHT SIDE

SPIRAL CURVE -
STATION - OFFSET