Given two intersecting vertical tangents at station [50+00] G_1 = -2% and G_2 = +3%, vertical curve 1000 *ft* long is used to connect the tangents. The elevation on the curve at station [48+00] is (+ 25.00 *ft*). **Find the station and elevation of the point on the curve where the grade is + 2%.**

Solution

To draw the curve we need station and elevation of PVC and PCT

Given PVI station [50+00]

The station of PVC

$$PVC_{Sta} = PVI_{Sta} - \frac{L}{2}$$

$$PVC_{Sta} = 5000 - \frac{1000}{2}$$

$$PVC_{Sta} = 5000 - 500 = 4500$$

$$PVC_{Sta} = 45 + 00 \ \ sta$$

The station of PVT

$$PVT_{Sta} = PVI_{Sta} + \frac{L}{2}$$

$$PVT_{Sta} = 5000 + \frac{1000}{2}$$

$$PVT_{Sta} = 5000 + \frac{1000}{2}$$

$$PVT_{Sta} = 5000 + 500$$

$$PVT_{Sta} = 55 + 00\ Sta$$

The elevation PVC.

Given the elevation at station [48+00] is (+ 25.00 ft) and

$$E_X = E_{PVC} + (\frac{G_1}{100})X + \frac{(G_2 - G_1)X^2}{200L}$$

$$25.00 = E_{PVC} + (\frac{-2}{100})300 + \frac{(3 - -2)300^2}{200*1000}$$

$$E_{PVC} = 28.75\ ft$$

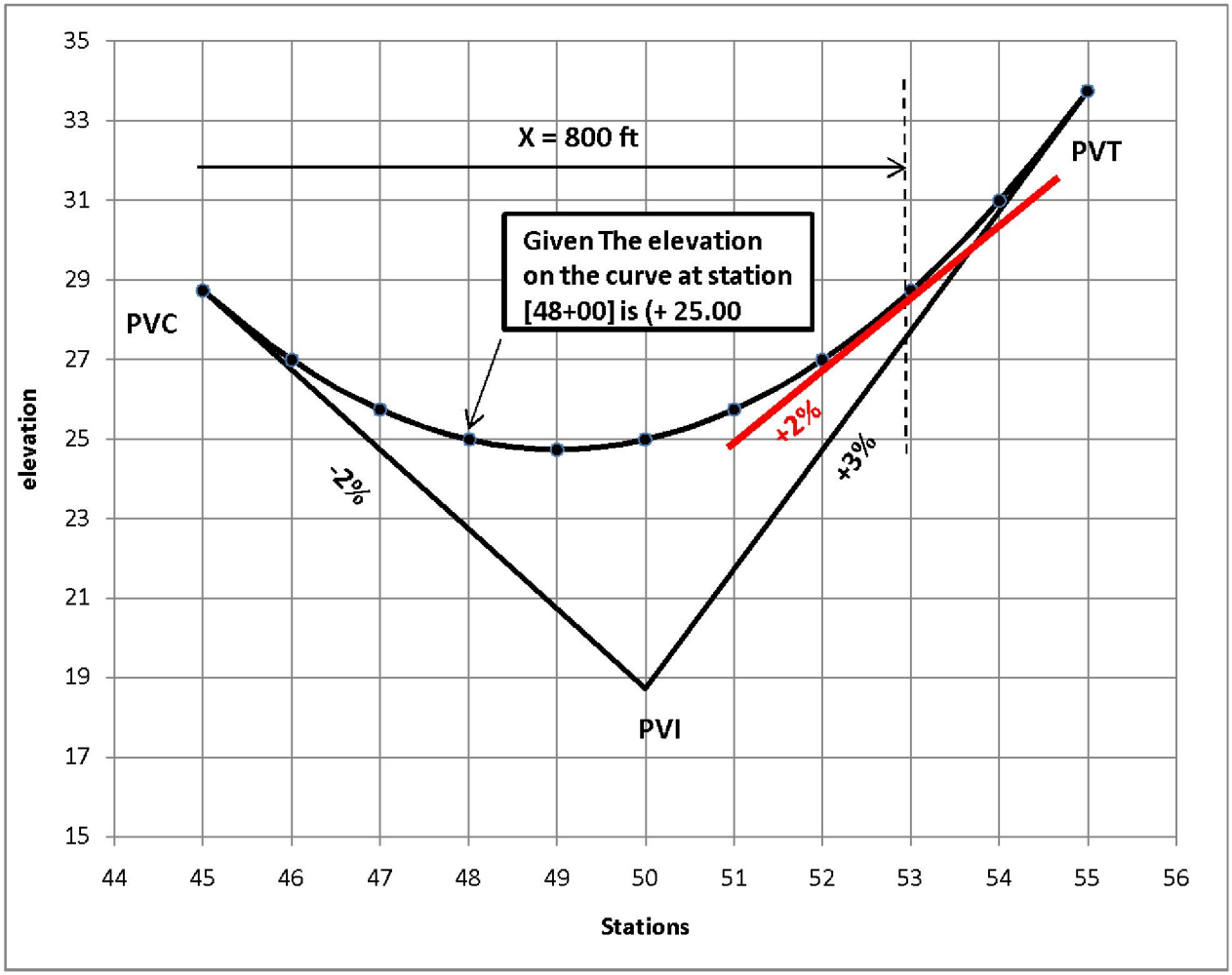
The elevation PVT.

$$E_X = E_{PVC} + (\frac{G_1}{100})X + \frac{(G_2 - G_1)X^2}{200L}$$

$$E_{PVT} = E_{PVC} + (\frac{G_1}{100})L + \frac{(G_2 - G_1)L^2}{200L}$$

$$E_{PVT} = 28.75 + (\frac{-2}{100})1000 + \frac{(3 - -2)1000^2}{200*1000}$$

$$E_{PVT} = 33.75\ ft$$



Station and elevation of the point on the curve(at grade is + 2%)

***لحل هذ ا لابد من ايجاد مشتقه معادلة المنحنى الراسي ونساويها بي +2%

$$E_X = E_{PVC} + (\frac{G_1}{100})X + \frac{(G_2 - G_1)X^2}{200L}$$

$$\frac{d_x}{d_y} = 0.02 = (\frac{G_1}{100}) + 2\frac{(G_2 - G_1)X}{200L}$$

$$X = \frac{200 * L(0.02 - \frac{G1}{100})}{2(G2 - G1)}$$

$$X = \frac{L(2-G1)}{(G2-G1)}$$

$$X = \frac{1000(2--2)}{(3--2)} = 800\,ft$$

The station of the point on the curve (at grade is + 2%)

$$Po\,\text{int}_{(at\,grade+2\%)Sta} = PVI_{Sta} + 800$$

$$Po\,\text{int}_{(at\,grade+2\%)Sta} = 4500 + 800$$

$$Po\,\text{int}_{(at\,grade+2\%)Sta} = 5300 = 53 + 00\,sta.$$

The elevation of the point on the curve (at grade is + 2%)

$$E_X = E_{PVC} + (\frac{G_1}{100})X + \frac{(G_2 - \mathrm{G}_1)\,\mathrm{X}^2}{200L}$$

Where: X = 800 ft

$$E_{(at\,grade+2\%)} = 28.75 + (\frac{-2}{100})800 + \frac{(3--2)800^2}{200*1000}$$

$$E_{(at\,grade+2\%)} = 28.75\,ft$$