Example:-

A -2% grade meets a 3% grade at a station 0+500. A vertical curve is to be used to connect the two grades. The elevation of the PVI is 100 m and the elevation of PVC is 106 m, determine

- The length of the curve
- The station of PVC
- The station and elevation of PVT.
- The elevation of the curve at PVI.
- The elevation and station of the high (low) point of the curve.

Solution

The length of the curve

$$E_{PVC} = E_{PVI} - \frac{G_1}{100}\frac{L}{2}$$

$$L = \frac{(E_{PVI} - E_{PVC}) * 2 * 100}{G_1}$$

$$L = \frac{(100 - 106) * 2 * 100}{-2}$$

$$L = 600m$$

The station of PVC

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

$$PVC_{Sta} = 0 + 500 - \frac{600}{2}$$

$$PVC_{Sta} = 0 + 500 - 300$$

$$PVC_{Sta} = 0 + 200 \quad sta$$

<u>The station and elevation of PVT.</u>

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

$$PVT_{Sta} = 0 + 500 + \frac{600}{2}$$

$$PVT_{Sta} = 0 + 500 + \frac{600}{2}$$

$$PVT_{Sta} = 0 + 500 + 300$$

$$PVT_{Sta} = 0 + 800 \; Sta$$

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

$$X = L$$

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

$$E_{PVT} = 106 + (\frac{-2}{100}) * 600 + \frac{(3-(-2))600^2}{200 * 600}$$

$$E_{PVT} = 109\,m$$

The elevation of the curve at PVI.

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

$$X = \frac{L}{2} = 300$$

$$E_{Curve\,at\,PVI} = 106 + (\frac{-2}{100}) * 300 + \frac{(3-(-2))300^2}{200*600}$$

$$E_{Curve\,at\,PVI} = 103.75\,m$$

The elevation and station of the high (low) point of the curve.

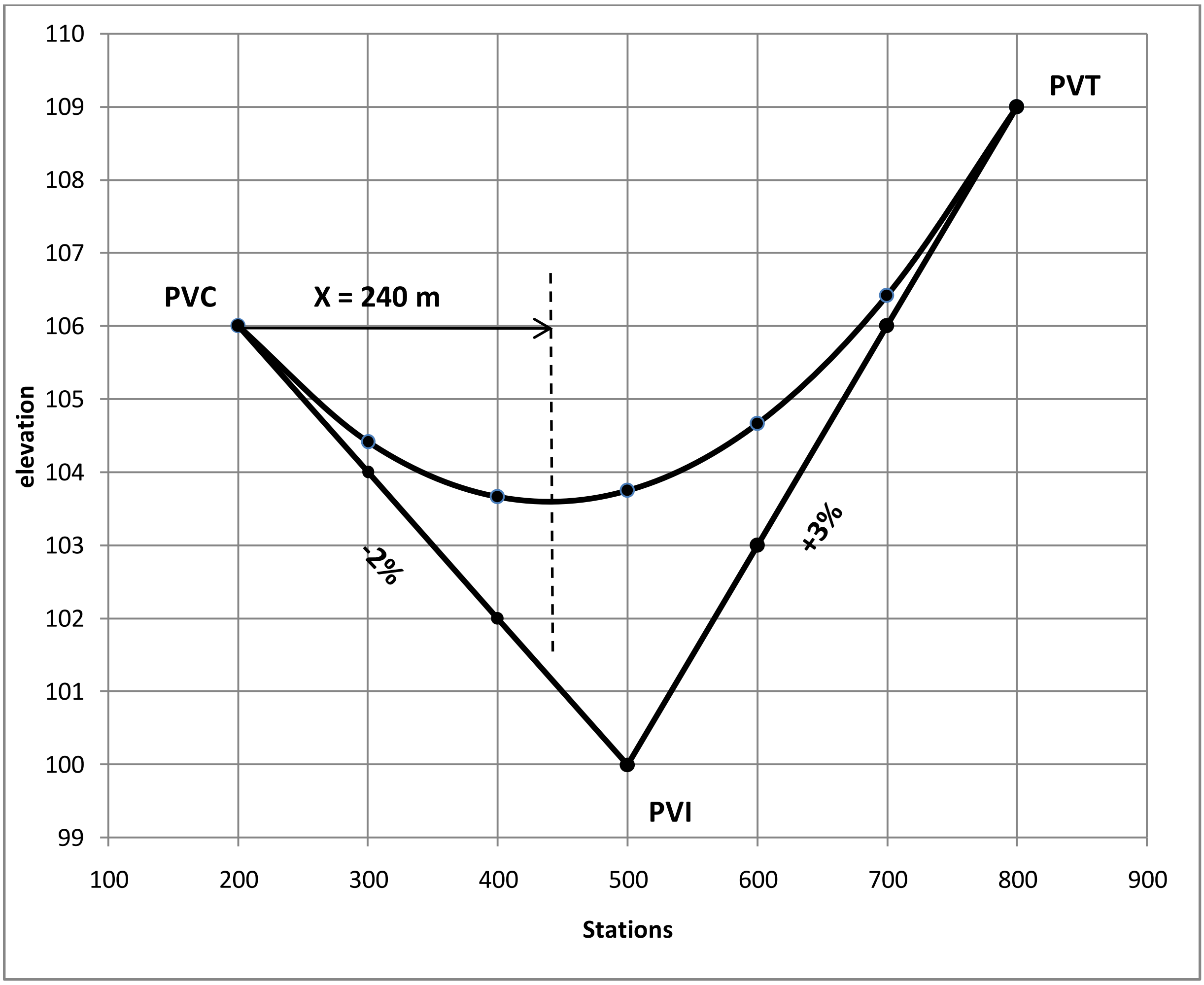
$$X_m = \left|\frac{G_1 L}{G_2 - G_1}\right|$$

$$X_m = \left|\frac{-2*600}{3-(-2)}\right| = 240\,m$$

$$E_{at\,X=240} = 106 + (\frac{-2}{100}) * 240 + \frac{(3-(-2))240^2}{200*600}$$

$$E_{at\,X=240} = 103.6\,m$$

$$Sta_{x=240} = 0 + 200 + 240 = 440\,sta$$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elevation
100
200
300
400
500
600
700
800
900
Stations
PVC
X = 240 m
PVT
PVI
-2%
+3%