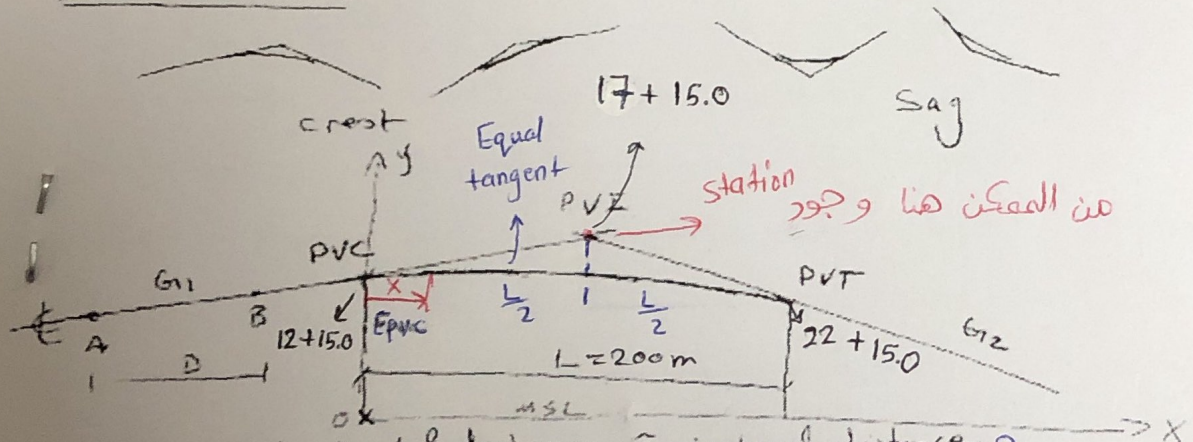
Lecture #9

∴ LVC = 480'

* Vertical curves (Parabolic curves):

Vertical Curves (parabolic Curves)



Assume : horizontal distance ≅ inclined distance

Elevations on tangent : $E_B = E_A + G_1 \times D$

parabolic equation:

$$y = ax^2 + bx + c$$

* (Horizontal curves) في Station وجود مستقيل

PI

* In vertical curves:

Assume horizontal distance = inclined distance

Elevations on tangent: $E_B = E_A + G_1 * D$

Parbolic equation: $y = ax^2 + bx + C$

- First condition: set $x = 0$

$$\longrightarrow y = C \quad , \quad y = E_{PVC}$$

$$\therefore \boxed{C = E_{PVC}}$$

- Second condition: find $\frac{dy}{dx}$ then set $x = 0$

$$\frac{dy}{dx} = 2ax + b$$

for $x = 0$, $\frac{dy}{dx} = b$; $\frac{dy}{dx} = G_1$

slope

$$\therefore \boxed{b = G_1}$$

$\longrightarrow$

- Third condition: find $\frac{d^2y}{dx^2}$:

$$\frac{d^2y}{dx^2} = 2a$$

↳ The change of slope throughout the curve

$$\frac{d^2y}{dx^2} = \frac{G_2 - G_1}{L} = 2a$$

$$\longrightarrow \boxed{a = \frac{G_2 - G_1}{2L}}$$

$$\therefore Y = \left(\frac{G_2 - G_1}{2L}\right) x^2 + G_1 x + E_{PVC}$$

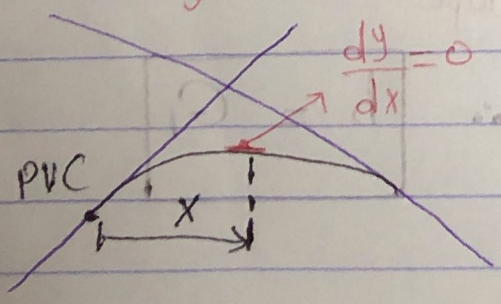
where : Y : elevation on curve

x : distance to PVC , $0 \leq X \leq L$

G_1, G_2 in decimals form

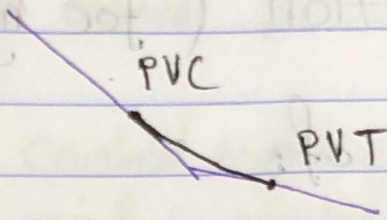
- Highest / lowest point : $\frac{dy}{dx} = 0 = 2\left(\frac{G_2 - G_1}{2L}\right)x + G_1$

crest ↙ sag ↙ ↙

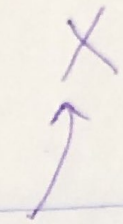


$$\therefore \longrightarrow X = \frac{-G_1 L}{G_2 - G_1}$$

↳ +ve



ما بقدر أحسب أعلى نقطة بالمعادلة لأنه لازم يكون عندي واحد نازل
وواحد طالع ، إنه يكون عند (grade +) و (grade -)
أما هنا ، فأعلى نقطة هي PVC
وأقل " هي PVT



* Cross section (for higways and RR):

- Mainly function of:

  "Volume of traffic and desired level of service"

* RR cross-section:

- Right of way (ROW): * Min. 6m for one track, but needs to be increase to accomodate cut and fill.

  * For open country, ROW 15-30 m are usually used.

- Types of cross section: ① At-grade : على مستوى سطح الأرض
  ② Depressed : منخفض عن الأرض
  ③ Elevated : مرتفع 6 وتحته باركنج ← يعمل noise pollution
  ④ Subway/underground