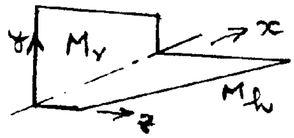
17 Assume $y_1 = a + bx$, $y_2 = \alpha + \beta x$ where a, b, α, β are const.
Then $z^2 = (a + bx)^2 + \lambda^2(\alpha + \beta x)^2$

$$\tfrac{1}{2}\, d(z^2)/dx = (ab + \lambda^2\alpha\beta) + (b^2 + \lambda^2\beta^2)x \qquad (1)$$

$$\tfrac{1}{2}\, d^2(z^2)/dx^2 = b^2 + \lambda^2\beta^2 > 0 \qquad (2)$$

So z^2 may have a turning value if (1) is zero. But the turning value must be a minimum via (2). Therefore any maximum value of z^2, and hence of z, must occur at the ends of the interval. This useful result is applicable to a beam eg. when moment diagrams in the vertical & horizontal planes might be as sketched.



Then maximum net bending moment, $M = \sqrt{(M_v^2 + M_h^2)}$, must occur at loads. The same reasoning is applicable to $M_E = \sqrt{(M^2 + T^2)}$ or $= \sqrt{(M^2 + \tfrac{3}{4}T^2)}$ in eq (11). The search is greatly reduced.