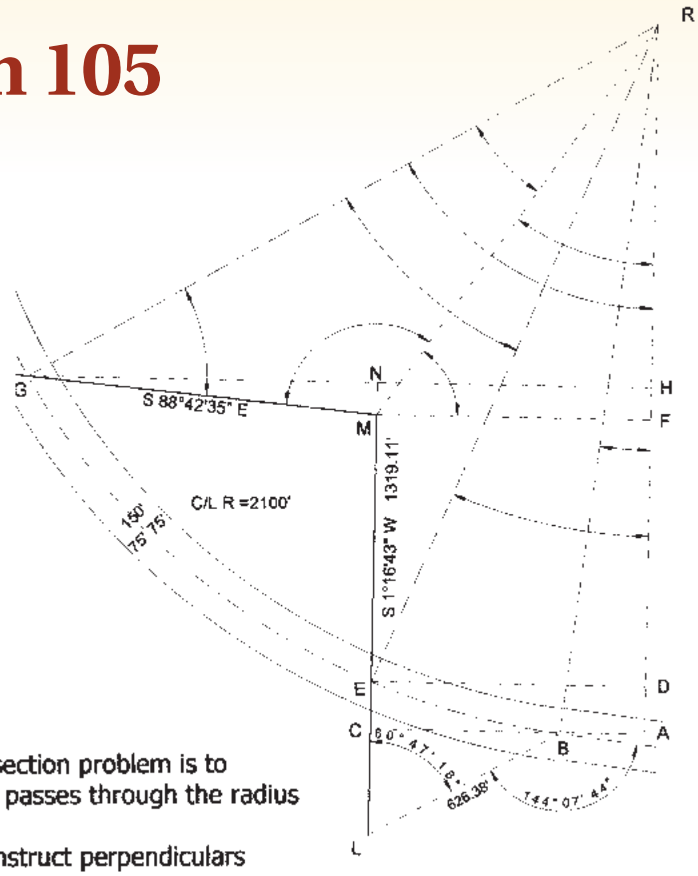
# Solution to Problem 105




The standard solution to any curve-line intersection problem is to construct a line parallel with the line of interest that passes through the radius point and then work with the sines of angles.

Construct line R-A parallel with side M-L. Construct perpendiculars through B and to E, M and G.

Angle CBL = 90° – 60°47'18" = 29°12'42" so that CB = 626.38x cos29°12'42" = 546.719' and CL = 626.38 cos 60°47'18" = 305.697'

Angle ABR = 90° – (180° – 144°07'44" – 29°12'42") = 83°20'26" and angle ARB = 6°39'34" so that AB = 2100 sin 6°39'34" = 243.532'

ED = CB + BA = 546.719' + 243.532' = 790.251'

Angle DRE = arcsin 790.251/2100 = 22°06'19"

AR = 2100 cos 6°12'42" = 2085.831' and DR=2100x cos22°06'19"=1945.637', so that CE = 2085.831' – 1945.637' = 140.194'

EM = 1319.11' – CL – CE = 1319.11' – 305.697' – 140.194' = 873.219'

RF = DR – FD = 1945.637' – 873.219' = 1072.418'

$RM^2 = MF^2 + RF^2 = 790.251^2 + 1072.418^2$, RM = 1332.132'

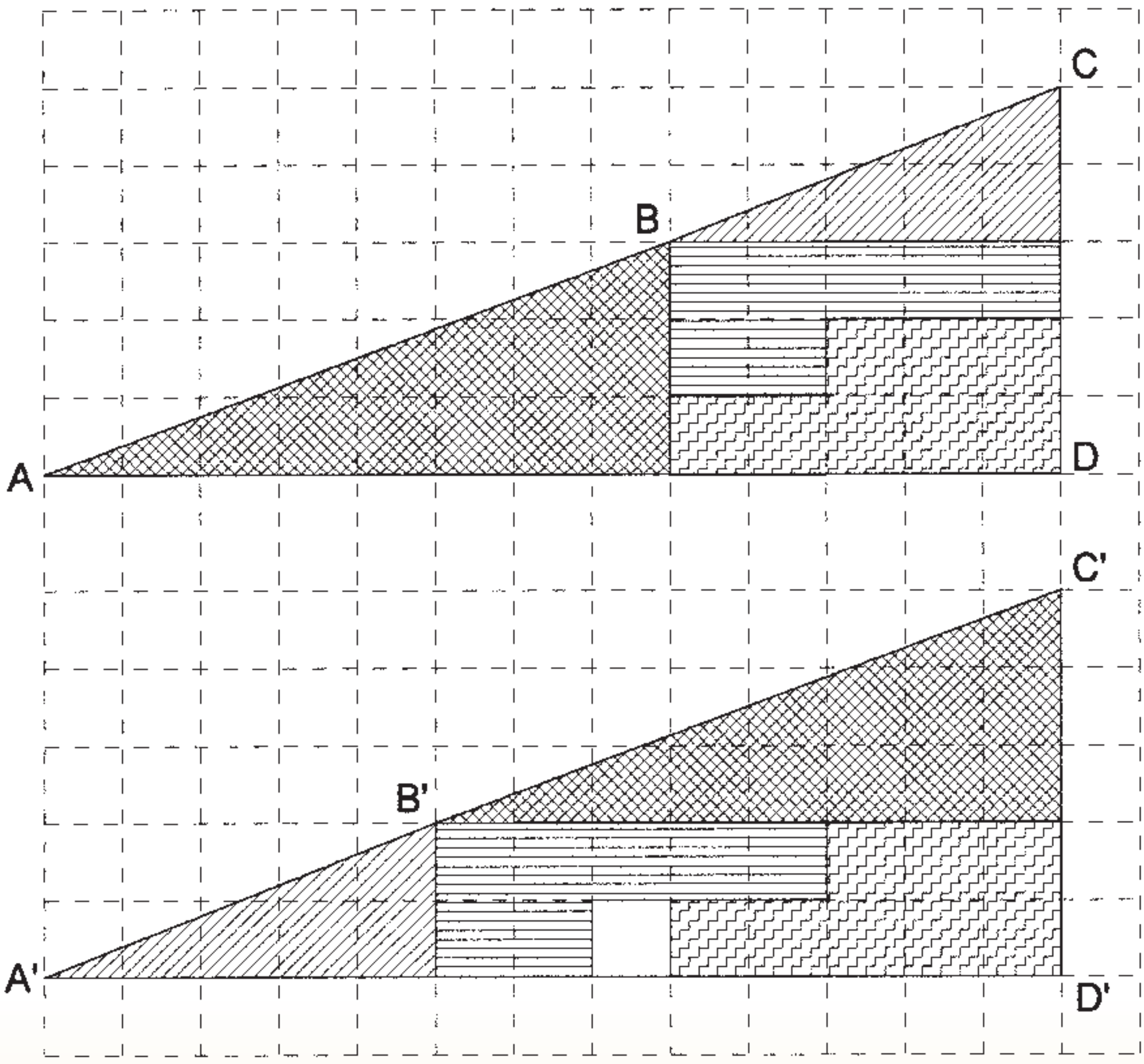
In triangle MRF, angle MRF = arcsin 790.251/1332.132 = 36°23'10" and angle RMF = arcsin 1072.418/1332.132 = 53°36'50"

In triangle GRM, angle GMR=360° – 90° – 90°00'42" –53°36'50" = 126°22'28", side GR = 2100' and side RM = 1332.132'. By the Law of Sines angle RGM = 30°42'50", making angle GRM = 22°54'42" and side GM = 1015.395'

Angle GRE is 22°54'42" + 36°23'10" – 22°06'19" = 37°11'33", making the centerline length through the parcel = 37°11'33" x $\pi$/180 x 2100 = 1363.18' and the area 1363.18' x 150' = 204,477 $ft^2$.

(You can check angle GRF by noting that MN = 1015.395 x sin 0°00'42" = 0.207, making RH = 1072.418' – 0.207' = 1072.211'. arcos 1072.211/2100 = 59°17'52", angle GRE = 59°17'52" – 22°06'19" = 39°11'33")

# Solution to Problem 106




NOTE THE SLOPE OF AB IN THE TOP FIGURE IS 3/8 AND THE SLOPE OF BC IS 2/5, SO AC IS NOT A STRAIGHT LINE.
B IN THE TOP FIGURE IS TOWARDS THE RIGHT ANGLE FROM A LINE JOINING A TO C, B' IN THE BOTTOM FIGURE IS AWAY FROM THE RIGHT ANGLE FROM A LINE JOINING A' TO C'.
ALL OF THE HATCHED PARTS ADD UP TO 32 SQUARE UNITS. A TRIANGLE JOINING A-C-D OR A'-C'-D' WOULD BE 32.5 SQUARE UNITS, SO THE DIFFERENCE BETWEEN A-B-C-D AND A'-B'-C'D' IS ONE SQUARE UNIT.