

## Re: Joining two straight lines with a smooth curve

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On 20 Aug 2004, Richard Owlett wrote:

> $y1 = a1*x + b1$

> $y2 = a2*x + b2$

> $ycurve = f(a1,a2,b1,b2)$

>*Question 1.*

>*The simplest case would be joining the two line segments with a*

>*tangent circular arc. I can do this with compass and straight edge. >Is there an analytical expression for a family of such arcs.*

>*This would have characteristic that first derivative of the curve*

>*would match the first derivative (slope) of the joined segment.*

Just like the geometric construction, you need to also determine offset  $d$ , radius of tangent circular arc. Write  $y1, y2$  into forms  $p = x \cos(\alpha) + y \sin(\alpha)$ , replace  $p$  with  $p-d$  to solve for the center of arc, when  $ycurve = f(a1, a2, b1, b2, d)$

>*Question 2.*

>*Are there analytical expressions for curves whose  $K$  higher order*

>*derivatives would be 0 at the point of tangency?*

For higher order contact, both curves should have a matching minimum order derivative, which is possible if straight lines  $y1, y2$  are replaced by higher order curves, say other circles or parabolas.