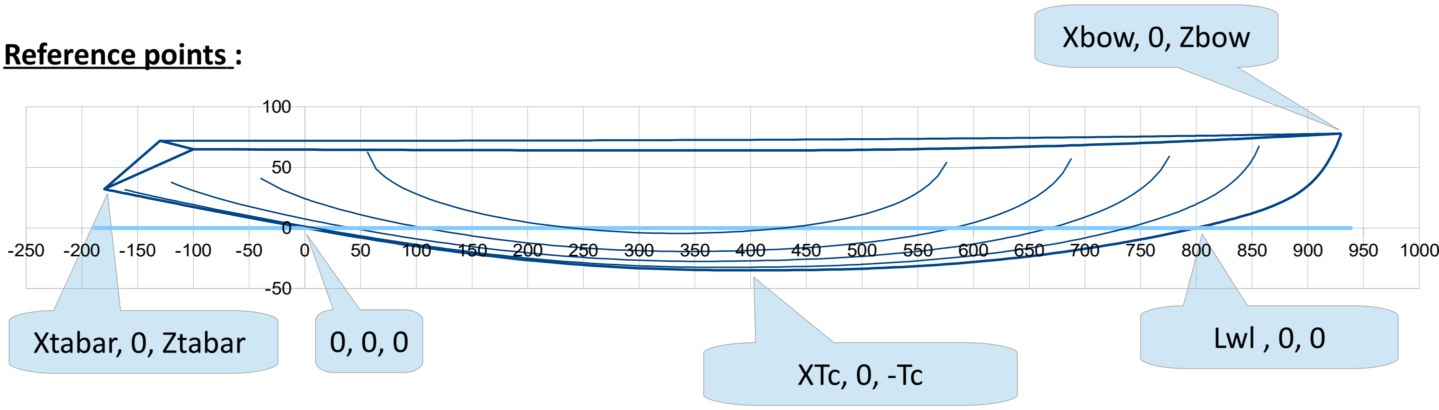
The keel line formulation in Gene-Hull 2.3

Coordinates system :
x = 0 at section C0 (= rear point of the waterline), x positive towards front
y = 0 in the symmetrical longitudinal plan, y positive towards starboard,
z = 0 waterline surface, z positive towards up

The keel line in the vertical plan of symmetry xz

Reference points :



The keel line is defined by 2 polynomes for respectively the fore part (when x > XTc) and the rear part (when x < XTc). Both polynomes are in the general form of :

$$z = -Tc + (x - XTc)^{[a + b (x-XTc)^{Cet}]} / c$$

, where coefficients a, b, c are computed using the input adimensional parameters Puiqar and Puiqav and the above geometrical data in order that the keel line can comply with the reference points showed here above.

Cet is an additional input adimensional parameter :

Cet , for the fore polynome, contibutes to shape the bow. Cet can usually be chosen in 0,1 to 100 range.
Cet = 1 for the rear polynome.

When applied within Gene-Hull notations, that gives :

Rear part of the keel line >>> for x such as Xtab ar < x < XTc :

$$z = -Tc + (Xtc - x) \wedge [PuiZoar + CorPuiZoar*((XTc - x) / XTc)] / Kar$$

, where Kar, CorPuiZoar and PuiZoar are :

$$Kar = XTc \wedge Puiqar / Tc$$

$$CorPuiZoar = [Log(Kar*(Ztabar + Tc)/Log(XTc - Xtabar) - Puiqar]/[(XTc - Xtabar)/XTc - 1]$$

PuiZoar = Puiqar – CorPuiZoar

Fore part of the keel line including the bow stem >>> for x such as XTc ≤ x < Xbow :

z = -Tc + (x - Xtc) ^ [PuiZoav + CorPuiZoav*((x - XTc)/(Lwl - XTc))^Cet] / Kav

, where Kav, CorPuiZoav and PuiZoav are :

Kav = (Lwl - XTc) ^ Puiqav / Tc

CorPuiZoav = [Log(Kav*(Zbow + Tc)/Log(Xbow – XTc) – Puiqav]/[((Xbow- XTc)/(Lwl - XTc)) ^ Cet - 1]

PuiZoav = Puiqav – CorPuiZoav

Numerical check (geometrical data unit = cm) :

Input geometrical data :

Xtabar = -130
Ztabar = 24

XTc = 400
Tc = 36,8

Lwl = 800

Xbow = 900
Zbow = 85

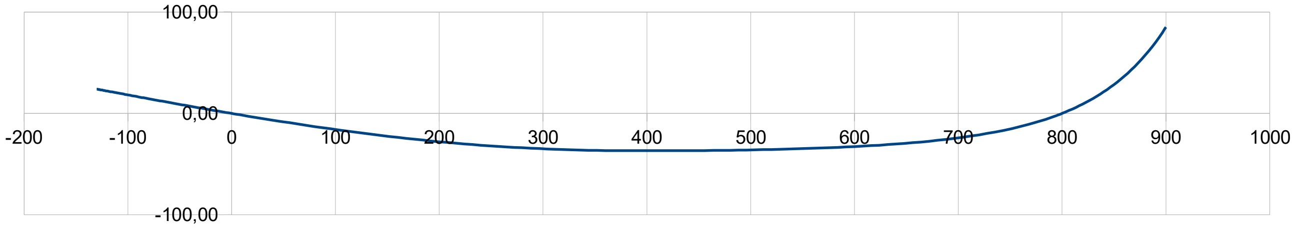
Input adimensional parameters :
Puiquav = 2,45
Puiqar = 2,35
Cet = 3

>>> computation of the coefficients :

Kar = 35399,18
CorPuiZoar = -0,07810
PuiZoar = 2,4281

Kav = 64446,47
CorPuiZoav = 0,10977
PuiZoav = 2,3402

>>> computation of the keel line xz profile :



3.1 Keel line		
Station	**x**	**z**
X tab ar	-130,00	24,00
Car2	-80,00	14,49
Car1	-40,00	7,10
C0	**0,00**	**0,00**
C1	80,00	-12,96
C2	160,00	-23,65
C3	240,00	-31,38
C4	320,00	-35,70
C5	400,00	-36,80
C6	480,00	-36,36
C7	560,00	-34,49
C8	640,00	-30,23
C9	720,00	-21,16
C9,5	760,00	-12,94
C9,9	792,00	-3,10
C10	**800,00**	**0,00**
Cav 1	833,33	16,85
Cav 2	866,67	43,02
Bow down	900,00	85,00
Bow up	900,00	85,00
(when hard chine)		

>>> If we change Xbow : 900 by 840 and Cet : 3 by 30, that gives :