2.4.- Plantillas

2.4.1.- Variables auxiliares

In[•]:=
```
(*Cinemática directa*)
SustCD1 =
  {a -> 1 + g^2, b -> 2 f g + g l5 - 2 g l4 Cos[θ4] - 2 l4 Sin[θ4], c -> f^2 - l3^2 + l4^2 + f l5 + l5^2/4 - l4 (2 f + l5) Cos[θ4]};
SustCD2 = {f -> (l1^2 - l2^2 + l3^2 - l4^2 + l1 l5 Cos[θ1] + l4 l5 Cos[θ4])/(2 (l5 + l1 Cos[θ1] - l4 Cos[θ4])), g -> (-2 l1 Sin[θ1] + 2 l4 Sin[θ4])/(2 (l5 + l1 Cos[θ1] - l4 Cos[θ4]))};
(*Cinemática inversa*)
(*θ1*)
SustCI1 = {a1 -> l1^2 - l2^2 - l1 l5 + l5^2/4 + 2 l1 X3 - l5 X3 + X3^2 + Y3^2,
   b1 -> -4 l1 Y3 , c1 -> l1^2 - l2^2 + l1 l5 + l5^2/4 - 2 l1 X3 - l5 X3 + X3^2 + Y3^2};

(*θ4*)
SustCI2 = {a2 -> -l3^2 + l4^2 + l4 l5 + l5^2/4 + 2 l4 X3 + l5 X3 + X3^2 + Y3^2,
   b2 -> -4 l4 Y3 , c2 -> -l3^2 + l4^2 - l4 l5 + l5^2/4 - 2 l4 X3 + l5 X3 + X3^2 + Y3^2};
```

2.4.2.- Cinemática directa

In[•]:=
```
(*Brazos arriba*)
Xmas = g ((-b + Sqrt[b^2 - 4 a c])/(2 a)) + f /. SustCD1 /. SustCD2;
Ymas = ((-b + Sqrt[b^2 - 4 a c])/(2 a)) /. SustCD1 /. SustCD2;

(*Brazos abajo*)
Xmenos = g ((-b - Sqrt[b^2 - 4 a c])/(2 a)) + f /. SustCD1 /. SustCD2;
Ymenos = ((-b - Sqrt[b^2 - 4 a c])/(2 a)) /. SustCD1 /. SustCD2;
```

2.4.3.- Cinemática inversa

```
(* σ1=1 *)
θ1mas = 2 ArcTan[(-b1 + Sqrt[b1^2 - 4 a1 c1])/(2 a1)] /. SustCI1;
(* σ1=-1 *)
θ1menos = 2 ArcTan[(-b1 - Sqrt[b1^2 - 4 a1 c1])/(2 a1)] /. SustCI1;
(* σ2=1 *)
θ4mas = 2 ArcTan[(-b2 + Sqrt[b2^2 - 4 a2 c2])/(2 a2)] /. SustCI2;

(* σ2=-1 *)
θ4menos = 2 ArcTan[(-b2 - Sqrt[b2^2 - 4 a2 c2])/(2 a2)] /. SustCI2;
```

2.4.4 .- Dibujar Barras

```
p3S2D = {Xmas, Ymas};
DibujarBarrasFunction[P_, c_, text_] := Module[
  {elementos},

  (*Union de los elementos*)
  elementos = {{P[[1]], P[[2]]}, {P[[2]], P[[3]]}, {P[[3]], P[[4]]}, {P[[4]], P[[5]]}, {P[[5]], P[[1]]}} /.
     {l1 → c[[1]], l2 → c[[2]], l3 → c[[3]], l4 → c[[4]], l5 → c[[5]]} /. {θ1 → c[6], θ4 → c[7]};

  Show[
   Table[Graphics[Line[elementos[[k]]]], {k, 1, Length[elementos]}],
   Table[Graphics[Text[Style[StringForm["l``", k], Bold, Red, 15], Mean[elementos[[k]]]]], {k, 1, 5}],
   Table[Graphics[Text[Style[ToString[k], Bold, Black, 15], elementos[[k, 1]]]], {k, Length[elementos]}],
   Axes -> True, AxesLabel → {x, y}, PlotLabel → text,
   GridLines → Automatic, GridLinesStyle → Directive[Gray, Dashed]]
  ]
```