**Ecuación diferencial para resolver la viga de wincler**

**%V' == -k\*v+q (1)**

**%M' == V (2)**

**%t' == M/EI (3)**

**%v' == t - V/Ac (4)**

**%derivo (2)**

**%M''=V' (5)**

Remplazo (5) en (1)

**M’’= -k\*v+q (6)**

**%derivo (6)**

**M’’’= -k\*v’+q’ (6)**

**-M’’’= k\*v’-q’**

**v’=(q’-M’’’)/k**

**% reemplazo (6) en (4)**

**(q-M’’’)/k= t - V/Ac (7)**

**Derivo (7)**

**(q’’-M4)/k= t’ – V’/Ac (7)**

**Remplazo (5) y (3) en (7)**

**(q’’-M4)/k= M/EI – M’’/Ac (7)**

**-M4/k+q’’/k-M/EI+M”/Ac=0**

**M4/k -M2/Ac+M/EI = q’’/k**

**multiplico todo por k**

**M4 -k\*M2/(Ac)+k\*M/EI = k\*q’’**

**Soluciono la ecuación general**

**(M4 -k\*M2/(Ac)+k\*M/EI==0**

**(M^4 -k\*M^2/(Ac)+k\*/EI)\*M==0 calculo raíces de polinomio en función de M**

**a=1**

**b=-k/Ac**

**c=k/EI**

**m=(-b/(2\*a)-(b^2-4\*a\*c)^(1/2)/(2\*a))^(1/2)**

**m=(k/(2\*Ac) - (k^2/Ac^2 - (4\*k)/EI)^(1/2)/2)^(1/2)**

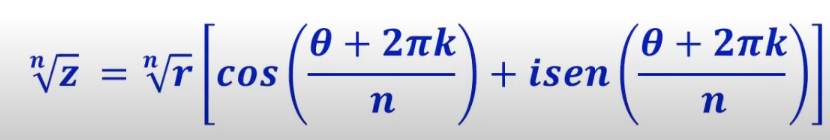
**m1=(k/(2\*Ac)-(k^2/(Ac^2\*4)-(k)/(EI))^(1/2))^(1/2)**

**separo en parte real y parte imaginaria**

re=k/(2\*Ac);

ima=-(k^2/(Ac^2\*4)-(k)/(EI))^(1/2);

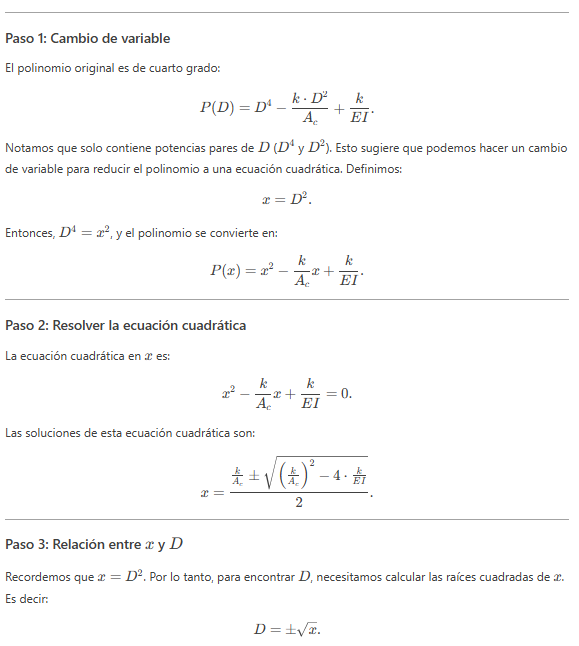
Uso teorema de Moivre

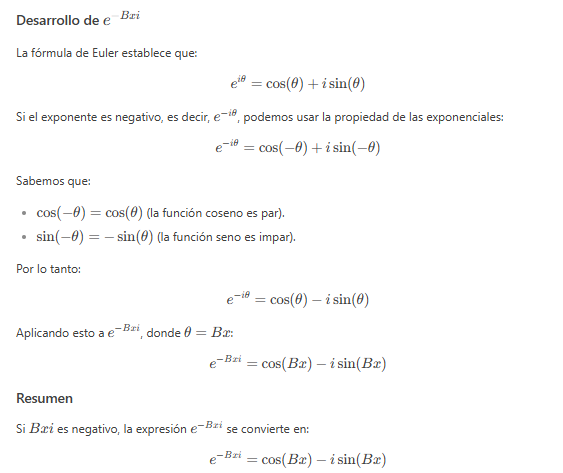


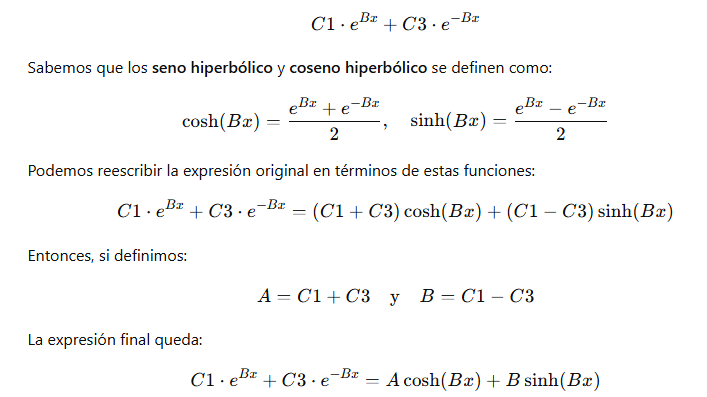
**r=(re^2+ima^2)^(1/2);**

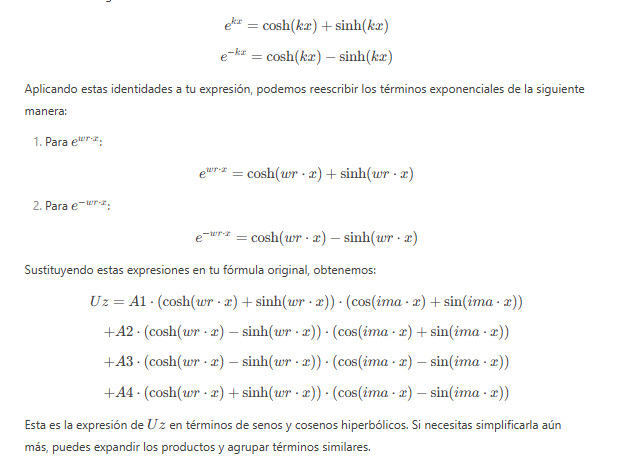
phi=atan2(ima,re);

n=2









**wr=r^(1/n)\*(cos((phi+2\*pi\*k1)/n)); parte real**

**wi=-r^(1/n)\*(sin((phi+2\*pi\*k1)/n)); parte imaginaria**

**solución exponencial y trigonométrica senos y cosenos**

M=cos(wi\*x)\*(C1\*exp(wr\*x)+C2\*exp(-wr\*x))+sin(wi\*x)\*(C3\*exp(wr\*x)+C4\*exp(-wr\*x));

**solución exponencial y trigonométrica senos hiperbólicos y cosenos hiperbólicos**

M=cos(wi\*x)\*(C1\*cosh(wr\*x)+C2\*sinh(wr\*x))+sin(wi\*x)\*(C3\*cosh(wr\*x)+C4\*sinh(wr\*x));

Las ecuaciones de los demás términos se hallan como se indica

V=diff(M,x,1);

v=-diff(V,x,1)/k;

t=V/Ac+diff(v,x,1);

ya luego se plantean las condiciones para hallar las constantes de integración

**Ecuación diferencial para resolver la viga de wincler solucionado el sistema de ecuaciones**

**%V' == -k\*v+q (1)**

**%M' == V (2)**

**%t' == M/EI (3)**

**%v' == t - V/Ac (4)**

**Obtengo los coeficientes de las ecuaciones y armo la matriz**

**V M t v**

val= [ 0,0 ,0 ,-k;

1,0 ,0 ,0;

0,1/EI,0 ,0;

-1/Ac, 0 ,1 ,0];

val2=[landa,0 ,0 ,0;

0 ,landa,0 ,0;

0 ,0 ,landa,0;

0 ,0 ,0 ,landa];

val3=det(val-val2);

sol= solve(val3==0)

(Ac\*EI\*landa^4 - EI\*k\*landa^2 + Ac\*k)/(Ac\*EI)==0

clc

clear

syms C1 C2 C3 C4 x A B C D k Ac EI L M k1 re ima xi

E = 24855578; % [kPa] modulo de elasticidad del concreto (NSR 10 - art C.8.5)

G = 0.4\*E; % [kPa] modulo de cortante (NSR 10 - art CR8.8.2)

L = 4; % [m] longitud

Ae = 0.4^2; % [m^2] area

I = 0.4^4/12; % [m^4] inercia

Ac=Ae\*G\*5/6; % coeficiente de correccion del cortante para seccion rectangular

k=500;

EI=E\*I;

re=k/(2\*Ac);

ima=-(-k^2/(Ac^2\*4)+(k)/(EI))^(1/2);

n=2;

r=(re^2+ima^2)^(1/2);

phi=atan2(ima,re);

k1=0;

wr=r^(1/n)\*(cos((phi+2\*pi\*k1)/n));

wi=-r^(1/n)\*(sin((phi+2\*pi\*k1)/n));

M=cos(wi\*x)\*(C1\*cosh(wr\*x)+C2\*sinh(wr\*x))+sin(wi\*x)\*(C3\*cosh(wr\*x)+C4\*sinh(wr\*x));

V=cos(x\*sin(atan2(-2\*(k/EI - k^2/(4\*Ac^2))^(1/2), k/Ac)/2)\*(k/EI)^(1/4))\*(C2\*cos(atan2(-2\*(k/EI - k^2/(4\*Ac^2))^(1/2), k/Ac)/2)\*cosh(x\*cos(atan2(-2\*(k/EI - k^2/(4\*Ac^2))^(1/2), k/Ac)/2)\*(k/EI)^(1/4))\*(k/EI)^(1/4) + C1\*cos(atan2(-2\*(k/EI - k^2/(4\*Ac^2))^(1/2), k/Ac)/2)\*sinh(x\*cos(atan2(-2\*(k/EI - k^2/(4\*Ac^2))^(1/2), k/Ac)/2)\*(k/EI)^(1/4))\*(k/EI)^(1/4)) - sin(x\*sin(atan2(-2\*(k/EI - k^2/(4\*Ac^2))^(1/2), k/Ac)/2)\*(k/EI)^(1/4))\*(C4\*cos(atan2(-2\*(k/EI - k^2/(4\*Ac^2))^(1/2), k/Ac)/2)\*cosh(x\*cos(atan2(-2\*(k/EI - k^2/(4\*Ac^2))^(1/2), k/Ac)/2)\*(k/EI)^(1/4))\*(k/EI)^(1/4) + C3\*cos(atan2(-2\*(k/EI - k^2/(4\*Ac^2))^(1/2), k/Ac)/2)\*sinh(x\*cos(atan2(-2\*(k/EI - k^2/(4\*Ac^2))^(1/2), k/Ac)/2)\*(k/EI)^(1/4))\*(k/EI)^(1/4)) - sin(atan2(-2\*(k/EI - k^2/(4\*Ac^2))^(1/2), k/Ac)/2)\*cos(x\*sin(atan2(-2\*(k/EI - k^2/(4\*Ac^2))^(1/2), k/Ac)/2)\*(k/EI)^(1/4))\*(C4\*sinh(x\*cos(atan2(-2\*(k/EI - k^2/(4\*Ac^2))^(1/2), k/Ac)/2)\*(k/EI)^(1/4)) + C3\*cosh(x\*cos(atan2(-2\*(k/EI - k^2/(4\*Ac^2))^(1/2), k/Ac)/2)\*(k/EI)^(1/4)))\*(k/EI)^(1/4) - sin(atan2(-2\*(k/EI - k^2/(4\*Ac^2))^(1/2), k/Ac)/2)\*sin(x\*sin(atan2(-2\*(k/EI - k^2/(4\*Ac^2))^(1/2), k/Ac)/2)\*(k/EI)^(1/4))\*(C2\*sinh(x\*cos(atan2(-2\*(k/EI - k^2/(4\*Ac^2))^(1/2), k/Ac)/2)\*(k/EI)^(1/4)) + C1\*cosh(x\*cos(atan2(-2\*(k/EI - k^2/(4\*Ac^2))^(1/2), k/Ac)/2)\*(k/EI)^(1/4)))\*(k/EI)^(1/4);

v=(C4\*cosh(x\*cos(angle((k - Ac\*(-(k\*(- 4\*Ac^2 + EI\*k))/(Ac^2\*EI))^(1/2)\*1i)/Ac)/2)\*(k/EI)^(1/4))\*cos(x\*sin(angle((k - Ac\*(-(k\*(- 4\*Ac^2 + EI\*k))/(Ac^2\*EI))^(1/2)\*1i)/Ac)/2)\*(k/EI)^(1/4))\*imag((k - Ac\*(-(k\*(- 4\*Ac^2 + EI\*k))/(Ac^2\*EI))^(1/2)\*1i)/Ac)\*abs(Ac)\*(k/EI)^(1/2) - C1\*cosh(x\*cos(angle((k - Ac\*(-(k\*(- 4\*Ac^2 + EI\*k))/(Ac^2\*EI))^(1/2)\*1i)/Ac)/2)\*(k/EI)^(1/4))\*cos(x\*sin(angle((k - Ac\*(-(k\*(- 4\*Ac^2 + EI\*k))/(Ac^2\*EI))^(1/2)\*1i)/Ac)/2)\*(k/EI)^(1/4))\*real((k - Ac\*(-(k\*(- 4\*Ac^2 + EI\*k))/(Ac^2\*EI))^(1/2)\*1i)/Ac)\*abs(Ac)\*(k/EI)^(1/2) + C2\*cosh(x\*cos(angle((k - Ac\*(-(k\*(- 4\*Ac^2 + EI\*k))/(Ac^2\*EI))^(1/2)\*1i)/Ac)/2)\*(k/EI)^(1/4))\*imag((k - Ac\*(-(k\*(- 4\*Ac^2 + EI\*k))/(Ac^2\*EI))^(1/2)\*1i)/Ac)\*sin(x\*sin(angle((k - Ac\*(-(k\*(- 4\*Ac^2 + EI\*k))/(Ac^2\*EI))^(1/2)\*1i)/Ac)/2)\*(k/EI)^(1/4))\*abs(Ac)\*(k/EI)^(1/2) + C3\*cos(x\*sin(angle((k - Ac\*(-(k\*(- 4\*Ac^2 + EI\*k))/(Ac^2\*EI))^(1/2)\*1i)/Ac)/2)\*(k/EI)^(1/4))\*sinh(x\*cos(angle((k - Ac\*(-(k\*(- 4\*Ac^2 + EI\*k))/(Ac^2\*EI))^(1/2)\*1i)/Ac)/2)\*(k/EI)^(1/4))\*imag((k - Ac\*(-(k\*(- 4\*Ac^2 + EI\*k))/(Ac^2\*EI))^(1/2)\*1i)/Ac)\*abs(Ac)\*(k/EI)^(1/2) - C2\*cos(x\*sin(angle((k - Ac\*(-(k\*(- 4\*Ac^2 + EI\*k))/(Ac^2\*EI))^(1/2)\*1i)/Ac)/2)\*(k/EI)^(1/4))\*sinh(x\*cos(angle((k - Ac\*(-(k\*(- 4\*Ac^2 + EI\*k))/(Ac^2\*EI))^(1/2)\*1i)/Ac)/2)\*(k/EI)^(1/4))\*real((k - Ac\*(-(k\*(- 4\*Ac^2 + EI\*k))/(Ac^2\*EI))^(1/2)\*1i)/Ac)\*abs(Ac)\*(k/EI)^(1/2) + C3\*cosh(x\*cos(angle((k - Ac\*(-(k\*(- 4\*Ac^2 + EI\*k))/(Ac^2\*EI))^(1/2)\*1i)/Ac)/2)\*(k/EI)^(1/4))\*sin(x\*sin(angle((k - Ac\*(-(k\*(- 4\*Ac^2 + EI\*k))/(Ac^2\*EI))^(1/2)\*1i)/Ac)/2)\*(k/EI)^(1/4))\*real((k - Ac\*(-(k\*(- 4\*Ac^2 + EI\*k))/(Ac^2\*EI))^(1/2)\*1i)/Ac)\*abs(Ac)\*(k/EI)^(1/2) + C1\*sinh(x\*cos(angle((k - Ac\*(-(k\*(- 4\*Ac^2 + EI\*k))/(Ac^2\*EI))^(1/2)\*1i)/Ac)/2)\*(k/EI)^(1/4))\*imag((k - Ac\*(-(k\*(- 4\*Ac^2 + EI\*k))/(Ac^2\*EI))^(1/2)\*1i)/Ac)\*sin(x\*sin(angle((k - Ac\*(-(k\*(- 4\*Ac^2 + EI\*k))/(Ac^2\*EI))^(1/2)\*1i)/Ac)/2)\*(k/EI)^(1/4))\*abs(Ac)\*(k/EI)^(1/2) + C4\*sinh(x\*cos(angle((k - Ac\*(-(k\*(- 4\*Ac^2 + EI\*k))/(Ac^2\*EI))^(1/2)\*1i)/Ac)/2)\*(k/EI)^(1/4))\*sin(x\*sin(angle((k - Ac\*(-(k\*(- 4\*Ac^2 + EI\*k))/(Ac^2\*EI))^(1/2)\*1i)/Ac)/2)\*(k/EI)^(1/4))\*real((k - Ac\*(-(k\*(- 4\*Ac^2 + EI\*k))/(Ac^2\*EI))^(1/2)\*1i)/Ac)\*abs(Ac)\*(k/EI)^(1/2))/(k\*abs(k - Ac\*(-(k\*(- 4\*Ac^2 + EI\*k))/(Ac^2\*EI))^(1/2)\*1i));

t=- (- cos(x\*sin(atan2(-2\*(k/EI - k^2/(4\*Ac^2))^(1/2), k/Ac)/2)\*(k/EI)^(1/4))\*(C2\*cos(atan2(-2\*(k/EI - k^2/(4\*Ac^2))^(1/2), k/Ac)/2)\*cosh(x\*cos(atan2(-2\*(k/EI - k^2/(4\*Ac^2))^(1/2), k/Ac)/2)\*(k/EI)^(1/4))\*(k/EI)^(1/4) + C1\*cos(atan2(-2\*(k/EI - k^2/(4\*Ac^2))^(1/2), k/Ac)/2)\*sinh(x\*cos(atan2(-2\*(k/EI - k^2/(4\*Ac^2))^(1/2), k/Ac)/2)\*(k/EI)^(1/4))\*(k/EI)^(1/4)) + sin(x\*sin(atan2(-2\*(k/EI - k^2/(4\*Ac^2))^(1/2), k/Ac)/2)\*(k/EI)^(1/4))\*(C4\*cos(atan2(-2\*(k/EI - k^2/(4\*Ac^2))^(1/2), k/Ac)/2)\*cosh(x\*cos(atan2(-2\*(k/EI - k^2/(4\*Ac^2))^(1/2), k/Ac)/2)\*(k/EI)^(1/4))\*(k/EI)^(1/4) + C3\*cos(atan2(-2\*(k/EI - k^2/(4\*Ac^2))^(1/2), k/Ac)/2)\*sinh(x\*cos(atan2(-2\*(k/EI - k^2/(4\*Ac^2))^(1/2), k/Ac)/2)\*(k/EI)^(1/4))\*(k/EI)^(1/4)) + sin(atan2(-2\*(k/EI - k^2/(4\*Ac^2))^(1/2), k/Ac)/2)\*cos(x\*sin(atan2(-2\*(k/EI - k^2/(4\*Ac^2))^(1/2), k/Ac)/2)\*(k/EI)^(1/4))\*(C4\*sinh(x\*cos(atan2(-2\*(k/EI - k^2/(4\*Ac^2))^(1/2), k/Ac)/2)\*(k/EI)^(1/4)) + C3\*cosh(x\*cos(atan2(-2\*(k/EI - k^2/(4\*Ac^2))^(1/2), k/Ac)/2)\*(k/EI)^(1/4)))\*(k/EI)^(1/4) + sin(atan2(-2\*(k/EI - k^2/(4\*Ac^2))^(1/2), k/Ac)/2)\*sin(x\*sin(atan2(-2\*(k/EI - k^2/(4\*Ac^2))^(1/2), k/Ac)/2)\*(k/EI)^(1/4))\*(C2\*sinh(x\*cos(atan2(-2\*(k/EI - k^2/(4\*Ac^2))^(1/2), k/Ac)/2)\*(k/EI)^(1/4)) + C1\*cosh(x\*cos(atan2(-2\*(k/EI - k^2/(4\*Ac^2))^(1/2), k/Ac)/2)\*(k/EI)^(1/4)))\*(k/EI)^(1/4))/Ac + (sin(x\*sin(atan2(-2\*(k/EI - k^2/(4\*Ac^2))^(1/2), k/Ac)/2)\*(k/EI)^(1/4))\*(C4\*cos(atan2(-2\*(k/EI - k^2/(4\*Ac^2))^(1/2), k/Ac)/2)^3\*cosh(x\*cos(atan2(-2\*(k/EI - k^2/(4\*Ac^2))^(1/2), k/Ac)/2)\*(k/EI)^(1/4))\*(k/EI)^(3/4) + C3\*cos(atan2(-2\*(k/EI - k^2/(4\*Ac^2))^(1/2), k/Ac)/2)^3\*sinh(x\*cos(atan2(-2\*(k/EI - k^2/(4\*Ac^2))^(1/2), k/Ac)/2)\*(k/EI)^(1/4))\*(k/EI)^(3/4)) - cos(x\*sin(atan2(-2\*(k/EI - k^2/(4\*Ac^2))^(1/2), k/Ac)/2)\*(k/EI)^(1/4))\*(C2\*cos(atan2(-2\*(k/EI - k^2/(4\*Ac^2))^(1/2), k/Ac)/2)^3\*cosh(x\*cos(atan2(-2\*(k/EI - k^2/(4\*Ac^2))^(1/2), k/Ac)/2)\*(k/EI)^(1/4))\*(k/EI)^(3/4) + C1\*cos(atan2(-2\*(k/EI - k^2/(4\*Ac^2))^(1/2), k/Ac)/2)^3\*sinh(x\*cos(atan2(-2\*(k/EI - k^2/(4\*Ac^2))^(1/2), k/Ac)/2)\*(k/EI)^(1/4))\*(k/EI)^(3/4)) + 3\*sin(atan2(-2\*(k/EI - k^2/(4\*Ac^2))^(1/2), k/Ac)/2)\*cos(x\*sin(atan2(-2\*(k/EI - k^2/(4\*Ac^2))^(1/2), k/Ac)/2)\*(k/EI)^(1/4))\*(C3\*cos(atan2(-2\*(k/EI - k^2/(4\*Ac^2))^(1/2), k/Ac)/2)^2\*cosh(x\*cos(atan2(-2\*(k/EI - k^2/(4\*Ac^2))^(1/2), k/Ac)/2)\*(k/EI)^(1/4))\*(k/EI)^(1/2) + C4\*cos(atan2(-2\*(k/EI - k^2/(4\*Ac^2))^(1/2), k/Ac)/2)^2\*sinh(x\*cos(atan2(-2\*(k/EI - k^2/(4\*Ac^2))^(1/2), k/Ac)/2)\*(k/EI)^(1/4))\*(k/EI)^(1/2))\*(k/EI)^(1/4) + 3\*sin(atan2(-2\*(k/EI - k^2/(4\*Ac^2))^(1/2), k/Ac)/2)\*sin(x\*sin(atan2(-2\*(k/EI - k^2/(4\*Ac^2))^(1/2), k/Ac)/2)\*(k/EI)^(1/4))\*(C1\*cos(atan2(-2\*(k/EI - k^2/(4\*Ac^2))^(1/2), k/Ac)/2)^2\*cosh(x\*cos(atan2(-2\*(k/EI - k^2/(4\*Ac^2))^(1/2), k/Ac)/2)\*(k/EI)^(1/4))\*(k/EI)^(1/2) + C2\*cos(atan2(-2\*(k/EI - k^2/(4\*Ac^2))^(1/2), k/Ac)/2)^2\*sinh(x\*cos(atan2(-2\*(k/EI - k^2/(4\*Ac^2))^(1/2), k/Ac)/2)\*(k/EI)^(1/4))\*(k/EI)^(1/2))\*(k/EI)^(1/4) - sin(atan2(-2\*(k/EI - k^2/(4\*Ac^2))^(1/2), k/Ac)/2)^3\*cos(x\*sin(atan2(-2\*(k/EI - k^2/(4\*Ac^2))^(1/2), k/Ac)/2)\*(k/EI)^(1/4))\*(C4\*sinh(x\*cos(atan2(-2\*(k/EI - k^2/(4\*Ac^2))^(1/2), k/Ac)/2)\*(k/EI)^(1/4)) + C3\*cosh(x\*cos(atan2(-2\*(k/EI - k^2/(4\*Ac^2))^(1/2), k/Ac)/2)\*(k/EI)^(1/4)))\*(k/EI)^(3/4) - sin(atan2(-2\*(k/EI - k^2/(4\*Ac^2))^(1/2), k/Ac)/2)^3\*sin(x\*sin(atan2(-2\*(k/EI - k^2/(4\*Ac^2))^(1/2), k/Ac)/2)\*(k/EI)^(1/4))\*(C2\*sinh(x\*cos(atan2(-2\*(k/EI - k^2/(4\*Ac^2))^(1/2), k/Ac)/2)\*(k/EI)^(1/4)) + C1\*cosh(x\*cos(atan2(-2\*(k/EI - k^2/(4\*Ac^2))^(1/2), k/Ac)/2)\*(k/EI)^(1/4)))\*(k/EI)^(3/4) + 3\*sin(atan2(-2\*(k/EI - k^2/(4\*Ac^2))^(1/2), k/Ac)/2)^2\*cos(x\*sin(atan2(-2\*(k/EI - k^2/(4\*Ac^2))^(1/2), k/Ac)/2)\*(k/EI)^(1/4))\*(k/EI)^(1/2)\*(C2\*cos(atan2(-2\*(k/EI - k^2/(4\*Ac^2))^(1/2), k/Ac)/2)\*cosh(x\*cos(atan2(-2\*(k/EI - k^2/(4\*Ac^2))^(1/2), k/Ac)/2)\*(k/EI)^(1/4))\*(k/EI)^(1/4) + C1\*cos(atan2(-2\*(k/EI - k^2/(4\*Ac^2))^(1/2), k/Ac)/2)\*sinh(x\*cos(atan2(-2\*(k/EI - k^2/(4\*Ac^2))^(1/2), k/Ac)/2)\*(k/EI)^(1/4))\*(k/EI)^(1/4)) - 3\*sin(atan2(-2\*(k/EI - k^2/(4\*Ac^2))^(1/2), k/Ac)/2)^2\*sin(x\*sin(atan2(-2\*(k/EI - k^2/(4\*Ac^2))^(1/2), k/Ac)/2)\*(k/EI)^(1/4))\*(k/EI)^(1/2)\*(C4\*cos(atan2(-2\*(k/EI - k^2/(4\*Ac^2))^(1/2), k/Ac)/2)\*cosh(x\*cos(atan2(-2\*(k/EI - k^2/(4\*Ac^2))^(1/2), k/Ac)/2)\*(k/EI)^(1/4))\*(k/EI)^(1/4) + C3\*cos(atan2(-2\*(k/EI - k^2/(4\*Ac^2))^(1/2), k/Ac)/2)\*sinh(x\*cos(atan2(-2\*(k/EI - k^2/(4\*Ac^2))^(1/2), k/Ac)/2)\*(k/EI)^(1/4))\*(k/EI)^(1/4)))/k;

K\_TE2 = (zeros(6));

N\_w2 = sym(zeros(1,6));

N\_t2 = sym(zeros(1,6));

for i = 1:6

[c1,c2,c3,c4]=solve(subs(v,x,0)==(i==2),...

subs(t,x,0)==(i==3),...

subs(v,x,L)==(i==5),...

subs(t,x,L)==(i==6),...

[C1,C2,C3,C4]);

N\_t2(i) = subs(t,{C1,C2,C3,C4,x},{c1,c2,c3,c4,L\*(1+xi)/2});

N\_w2(i) = subs(v,{C1,C2,C3,C4,x},{c1,c2,c3,c4,L\*(1+xi)/2});

% # se evaluan las reacciones horizontales y verticales y los momentos en los apoyos

K\_TE2(:,i)=double(([ 0;

subs(V,{C1,C2,C3,C4,x},{c1,c2,c3,c4,0}); % Y2

-subs(M,{C1,C2,C3,C4,x},{c1,c2,c3,c4,0}); % M2

0;

-subs(V,{C1,C2,C3,C4,x},{c1,c2,c3,c4,L}); % Y2

subs(M,{C1,C2,C3,C4,x},{c1,c2,c3,c4,L})]));% M2

end

syms xi

%# Se convierten las funciones de forma a coordenadas naturales,

%% Funciones de forma

N\_u2 =[ 1/2 - xi/2, 0, 0, xi/2 + 1/2, 0, 0];

%N\_u2 = simplify(subs(N\_u2,x, L\*(1+xi)/2));

%N\_w2 = simplify(subs(N\_w2,x, L\*(1+xi)/2)); %# x = L\*xi/2 + L/2

%N\_t2 = simplify(subs(N\_t2,x, L\*(1+xi)/2));

N1 = vertcat(N\_u2,N\_w2);

N2= vertcat(N\_t2);

%% Derivadas funciones de forma

dx\_dxi = L/2; % jacobiano de la transformacion isoparametrico

dN\_u2 = diff(N\_u2,1,xi)/dx\_dxi;

dN\_w2 = diff(N\_w2,1,xi)/dx\_dxi;

dN\_t2 = diff(N\_t2,1,xi)/dx\_dxi;

%% MOMENTOS DE EMPOTRAMIENTO

ba = 25; % [kN/m] carga uniforme distribuida vertical inicial

bb = 40;

b = (bb-ba)\*x/L +ba; % [kN/m] carga uniforme distribuida axial

wa = 25; % [kN/m] carga uniforme distribuida vertical inicial

wb = 40; % [kN/m] carga uniforme distribuida vertical final

w =(wb-wa)\*x/L + wa; % carga trapezoidal

wf = simplify(subs(w,x, L\*(1+xi)/2));

bf = simplify(subs(b,x, L\*(1+xi)/2));

MV = double(int(N\_u2'\*bf\*dx\_dxi + N\_w2'\*wf\*dx\_dxi,xi,-1,1));