DERIVACIÓN NUMÉRICA

La distancia recorrida por un automóvil viene dada así: $D_{(t)} = -70 + 7t + 70e^{-t/10}$, determine el valor aproximado de la velocidad $V_{(4.25)}$, EMPLEANDO LA FÓRMULA CENTRADA DE TRES PUNTOS, considerando h = 1/20; además obtenga el VALOR EXACTO de la velocidad y determine el error. Emplee QUINCE decimales.

```
>> to=4.25;h=1/20;syms t
>> f=-70+7*t+70*exp(-t/10);
>> velocidad_aprox=(1/(2*h))*(subs(f,to+h)-subs(f,to-h))

velocidad_aprox =   2.423592435781714

>> velocidad_exacta=subs(diff(f,t),to)

velocidad_exacta =   2.423611504091070

>> error=abs(velocidad_exacta-velocidad_aprox)

error =    1.906830935549664e-005
```

En un circuito RLC, la carga que circula cuando se cierra un interruptor, en función del tiempo, viene dada por la ecuación:

$$q(t) = q_o e^{-Rt/(2L)} \cos\left(\sqrt{\frac{1}{LC} - \left(\frac{R}{2L}\right)^2}\, t\right)$$

donde: qo = 500 Coulomb
R = 200 Ω
L = 10 H
C = 100μF

Determine el valor aproximado de la corriente que circula cuando el tiempo sea igual a 1.3 seg, EMPLEANDO LA FÓRMULA CENTRADA DE CINCO PUNTOS, considere h = 1/600; además obtenga el VALOR EXACTO de la corriente y determine el error. Emplee Quince decimales.

```
>> R=200;L=10;C=100e-6;qo=500; to=1.3;h=1/600;syms t
>> Q=qo*exp(-R*t/(2*L))*cos(sqrt(1/(L*C)-(R/(2*L))^2*t));
>> I_aprox=(1/(12*h))*(subs(Q,to-2*h)-8*subs(Q,to-h)+8*subs(Q,to+h)-subs(Q,to+2*h))
I_aprox =   0.002068524254356
>> I_exacta=subs(diff(Q,t),to)  =   0.002068524239951
>> error=abs(I_exacta-I_aprox)  =    1.440514894868183e-011
```

Si se sabe que $g_{(x)} = 5\log^3_{15}(25 - x^2) + \cos^{-1}(e^{2x})$, determine $g''_{(-0.25)}$, considere h= 1/200; además obtenga el valor exacto y determine el error. Emplee Quince decimales.

```
>> xo=-1/4;h=1/200;syms x
>> g=5*(log(25-x^2)/log(15))^3+acos(exp(2*x));
>> derivada_aprox=(1/h^2)*(subs(g,xo-h)-2*subs(g,xo)+subs(g,xo+h))

derivada_aprox =  -5.455767666830980

>> derivada_exacta=subs(diff(g,x,2),xo)

derivada_exacta =  -5.455241889660876

>> error=abs(derivada_exacta-derivada_aprox)

error =    5.257771701039360e-004
```

Emplee la extrapolación de Richardson para aproximar $g'_{(-2.65)}$, mediante $N_5(h)$, si se sabe que $g_{(x)} = \cot(3x + 5)\log(x^2 - 7)^3 - x^2\sec^{-1}(e^{-3/x})$, considere h=1/500, además obtenga el VALOR EXACTO y determine el error. Emplee Quince decimales.

```
>> xo = -2.65;h=1/500;syms x
>> g=3*cot(3*x+5)*log10(x^2-7)-x^2*asec(exp(-3/x));
>> n11=(1/(2*h))*(subs(g,xo+h)-subs(g,xo-h))
n11 =   -1.290708940675044e+003
>> n21=(1/(2*h/2))*(subs(g,xo+h/2)-subs(g,xo-h/2))
n21 =   -1.195072106436964e+003
>> n31=(1/(2*h/4))*(subs(g,xo+h/4)-subs(g,xo-h/4))
n31 =   -1.174321367270515e+003
>> n41=(1/(2*h/8))*(subs(g,xo+h/8)-subs(g,xo-h/8))
n41 =   -1.169299471152016e+003
>> n51=(1/(2*h/16))*(subs(g,xo+h/16)-subs(g,xo-h/16))
n51 =   -1.168053951118026e+003

>> n22=(4*n21-n11)/3
n22 =   -1.163193161690937e+003
>> n32=(4*n31-n21)/3
n32 =   -1.167404454215033e+003
>> n42=(4*n41-n31)/3
n42 =   -1.167625505779183e+003
>> n52=(4*n51-n41)/3
n52 =   -1.167638777773362e+003
>> n33=(16*n32-n22)/15
n33 =   -1.167685207049972e+003
>> n43=(16*n42-n32)/15
n43 =   -1.167640242550126e+003
>> n53=(16*n52-n42)/15
n53 =   -1.167639662572974e+003

>> n44=(64*n43-n33)/63
n44 =   -1.167639528827906e+003
>> n54=(64*n53-n43)/63
n54 =   -1.167639653366988e+003

>> n55=(256*n54-n44)/255
n55 =   -1.167639653855376e+003

>> Valor_exacto=subs(diff(g,x),xo)
Valor_exacto =   -1.167639653762259e+003

>> error=abs(Valor_exacto-n55)
error =    9.311747817264404e-008
```

INTEGRACIÓN NUMÉRICA

Aproxime la longitud de la curva y = ln(cos(x)), en el intervalo $0 \le x \le \pi/3$, empleando la REGLA DEL TRAPECIO; además obtenga el valor exacto y determine el error.

```
>> syms x
>> a=0;b=pi/3;h=b-a;f=sec(x);
>> Longitud_aprox=(h/2)*(subs(f,a)+subs(f,b))

Longitud_aprox =   1.570796326794896

>> Longitud_exacta=double(int(f,x,a,b))

Longitud_exacta =   1.316957896924817

>> error=abs(Longitud_aprox-Longitud_exacta)

error =   0.253838429870079
```

Aproxime la longitud de la curva $(y-1)^3 = x^2$, en el intervalo $0 \le x \le 8$, empleando la REGLA DE SIMPSON; además obtenga el valor exacto y determine el error.

```
>> syms y
>> a=1;b=5;h=(b-a)/2;f=(1/2)*sqrt(9*y-5);yo=a;y1=yo+h;y2=b;
>> Longitud_aprox=(h/3)*(subs(f,yo)+4*subs(f,y1)+subs(f,y2))

Longitud_aprox =   9.028739453210159

>> Longitud_exacta=double(int(f,y,1,5))

Longitud_exacta =   9.073415289387791

>> error=abs(Longitud_aprox-Longitud_exacta)

error =   0.044675836177632
```

Aproxime el volumen del sólido de revolución que se obtiene al girar alrededor de la recta x = – 2, la región limitada por la gráfica de $x = y^2 - y$, $x = 3 - y^2$. Empleando LA REGLA DE 3/8 DE SIMPSON; además obtenga el valor exacto y determine el error.

```
>> a=-1;b=3/2;h=(b-a)/3;yo=a;y1=yo+h;y2=y1+h;y3=y2+h;syms y; f=pi*((5-y^2)^2-(y^2-y+2)^2);
>> vol_aprox=(3*h/8)*(subs(f,y,yo)+3*subs(f,y,y1)+3*subs(f,y,y2)+subs(f,y,y3))
vol_aprox =   1.10446617277662e+002
>> vol_exact=int(f,y,a,b)
vol_exact =   1125/32*pi
 >> error=abs(vol_exact-vol_aprox)  =  0
```

Aproxime el volumen del sólido de revolución que se obtiene al girar alrededor de la recta x = 12, la región limitada por la gráfica de 2x – 2 = y², y = x – 5. Empleando LA REGLA DE BOOLE; además obtenga el valor exacto y determine el error.

```
>> syms y
>> f=pi*((11-0.5*y^2)^2-(7-y)^2);a=-2;b=4;h=(b-a)/4;yo=a;y1=yo+h;y2=y1+h;y3=y2+h;y4=b;
>>
vol_aprox=(2*h/45)*(7*subs(f,y,yo)+32*subs(f,y,y1)+12*subs(f,y,y2)+32*subs(f,y,y3)+7*subs(f,y,y4))

vol_aprox =     8.821592171280138e+02

>> volumen_exacto=int(f,y,a,b)

volumen_exacto =   1404/5*pi

 >> error=abs(volumen_exacto-vol_aprox)

error =    0
```

Resuelva la siguiente integral: $\int_{1.4}^{1.9} \frac{x^2\,dx}{\sqrt{2x - x^2}}$**, empleando LA FÓRMULA ABIERTA DE NEWTON-COTES CON N = 3. Además obtenga el valor exacto de la integral y obtenga el error.**

```
>> a=1.4;b=1.9;h=(b-a)/(3+2);xo=a+h;x1=xo+h;x2=x1+h;x3=x2+h;syms x; f=(x^2)/sqrt(2*x-x^2);
>> I_aprox=(5*h/24)*(11*subs(f,x,xo)+subs(f,x,x1)+subs(f,x,x2)+11*subs(f,x,x3))

I_aprox =    1.983867661827656

>> I_exact=int(f,x,a,b)

I_exact =    2.010782068009824

>> error=abs(I_exact-I_aprox)   =    0.026914406182168
```

Una compuerta vertical, de una presa, en un dique tiene la forma de un trapecio, con 16 pies en la parte superior y 12 pies en el fondo, con una altura de 10 pies. ¿Cuál es la fuerza del fluido en la compuerta cuando la parte superior está a 8 pies debajo de la superficie del agua? Emplee LA REGLA COMPUESTA DEL TRAPECIO, CON N = 14. Además obtenga el valor exacto y el error.

```
>>a=-18;b=-8;h=(b-a)/14;yo=a;y1=yo+h;y2=y1+h;y3=y2+h;y4=y3+h;y5=y4+h;y6=y5+h;
y7=y6+h;y8=y7+h; y9=y8+h;y10=y9+h;y11=y10+h;y12=y11+h;y13=y12+h;y14=y13+h;syms y
>> f=62.4*(-2*y/5)*(y+48);
>>
Fuerza_aprox=(h/2)*(subs(f,y,yo)+2*(subs(f,y,y2)+subs(f,y,y4)+subs(f,y,y6)+subs(f,y,y8)+subs(f,y,y
10)+subs(f,y,y12))+2*(subs(f,y,y1)+subs(f,y,y3)+subs(f,y,y5)+subs(f,y,y7)+subs(f,y,y9)+subs(f,y,y11)
+subs(f,y,y13))+subs(f,y,y14))
Fuerza_aprox =    1.114667755102041e+005

>> Fuerza_exact=int(f,y,a,b)
Fuerza_exact =    111488

>> error=abs(Fuerza_exact-Fuerza_aprox)
error =   21.224489795917179
```

Se tiene un tanque de forma esférica, cuyo radio es de 10 pies. El tanque se encuentra medio lleno de gasolina que pesa 42 lb/pie³. Emplee LA REGLA COMPUESTA DE SIMPSON, CON N = 14, para aproximar el trabajo requerido para extraer el combustible a través de un orificio en la parte superior del tanque. Además obtenga el valor exacto y el error.

```
>> a=0;b=10;h=(b-a)/14;yo=a;y1=yo+h;y2=y1+h;y3=y2+h;y4=y3+h;y5=y4+h;y6=y5+h;y7=y6+h;
y8=y7+h;y9=y8+h;y10=y9+h;y11=y10+h;y12=y11+h;y13=y12+h;y14=y13+h;syms y
>> f=42*pi*(20*y-y^2)*(20-y);
>> Trabj_aprox=(h/3)*(subs(f,y,yo)+2*(subs(f,y,y2)+subs(f,y,y4)+subs(f,y,y6)+subs(f,y,y8)+
subs(f,y,y10)+subs(f,y,y12))+4*(subs(f,y,y1)+subs(f,y,y3)+subs(f,y,y5)+subs(f,y,y7)+subs(f,y,y9)+
subs(f,y,y11)+subs(f,y,y13))+subs(f,y,y14))

Trabj_aprox =    1.209513171632070e+006

>> Trabj_exact=int(f,y,a,b)

Trabj_exact =   385000*pi   =   1.209513171632070e+006
 >> error=abs(Trabj_exact-Trabj_aprox)    =    6.963047392662267e-011
```

Aproxime la longitud de la curva: $y^2 = \frac{1}{9}x(3x-1)^2$ desde x = 1 hasta x = 4, empleando LA INTEGRACIÓN DE ROMBERG para aproximar dicha integral mediante $R_{5,5}$. Además obtenga el VALOR EXACTO y determine el error.

```
>> syms x
>> f=sqrt((1/9)*x*(3*x-1)^2);G=sqrt(1+(diff(f,x))^2)= (1/6)*(9*x+1)/ x
^(1/2) ; a=1;b=4;h1=(b-a);h2=h1/2;h3=h1/4;h4=h1/8;h5=h1/16;
>> r11=(h1/2)*(subs(G,a)+subs(G,b))
r11 =   7.125000000000000
>> r21=(1/2)*(r11+h1*subs(G,a+h2))
r21 =   7.278176250697846
>> r31=(1/2)*(r21+h2*(subs(G,a+h3)+subs(G,a+3*h3)))
r31 =   7.319274473051710
>>r41=(1/2)*(r31+h3*(subs(G,a+h4)+subs(G,a+3*h4)+subs(G,a+5*h4)
+subs(G,a+7*h4)))
r41 =   7.329799732480932
>>r51=(1/2)*(r41+h4*(subs(G,a+h5)+subs(G,a+3*h5)+subs(G,a+5*h5)
+subs(G,a+7*h5)+subs(G,a+9*h5)+subs(G,a+11*h5)+subs(G,a+13*h5)
+subs(G,a+15*h5)))
r51 =   7.332448726684582

>> r22=(4*r21-r11)/3
r22 =   7.329235000930461
>> r32=(4*r31-r21)/3
r32 =   7.332973880502998
>> r42=(4*r41-r31)/3
r42 =   7.333308152290673
>> r52=(4*r51-r41)/3
r52 =   7.333331724752465
```

```
>> r33=(16*r32-r22)/15
r33 =   7.333223139141166
>> r43=(16*r42-r32)/15
r43 =   7.333330437076517
>> r53=(16*r52-r42)/15
r53 =   7.333333296249919

>> r44=(64*r43-r33)/63
r44 =   7.333332140218348
>> r54=(64*r53-r43)/63
r54 =   7.333333341633623

>> r55=(256*r54-r44)/255
r55 =   7.333333346345055
 Longitud_exacta=double(int(G,x,a,b))
Longitud_exacta =
   7.333333333333333

>> error=abs(Longitud_exacta-r55)
error =
    1.301172236622961e-008
```

Aproxime la longitud de arco de la curva $9y^2 = x^2(2x+3)$, en el segundo cuadrante, desde $x = \frac{-7}{5}$ hasta $x = \frac{-3}{5}$, empleando MÉTODO ADAPTATIVO DE CUADRATURA, además obtenga el VALOR EXACTO y el error de aproximación.

```
>> syms x
>> f=sqrt((x^2*(2*x+3))/9); F=sqrt(1+(diff(f,x))^2);a=–7/5;b=–3/5;h=(b-a)/2;
>>
Longitud_de_arco=(h/6)*(subs(F,a)+4*subs(F,a+h/2)+subs(F,a+h))+(h/6)*(subs(F,a+h)+4*subs(F,a+3*h/2)+subs(F,b))
Longitud_de_arco =  0.838204122310082
>> Longitud_exacta=double(int(F,x,a,b))
Longitud_exacta =  0.834798711599921
>> error=abs(Longitud_exacta-Longitud_de_arco)  =  0.003405410710161
```

Un tanque en forma de cono circular recto invertido tiene un diámetro de 40 pies en su parte superior y una profundidad de 30 pies. Si el tanque se llena hasta 5/6 de su altura con aceite, calcule el trabajo efectuado al bombear el aceite hasta un depósito que se encuentra a 5 pies a partir de la parte superior del tanque, empleando CUADRATURA GAUSSIANA CON N = 11; además obtenga el VALOR EXACTO y determine el error. Emplee Quince decimales. El aceite pesa 50 lb/pie³.

```
>> p=[1 0 -55/21 0 330/133 0 -330/323 0 55/323 0 -33/4199 0];
>>syms x;
>>m=roots(p)
m =
          0
  -0.978228658146066
  -0.887062599768081
  -0.730152005574056
  -0.519096129206811
  -0.269543155952345
   0.978228658146069
   0.887062599768080
   0.730152005574051
   0.519096129206813
   0.269543155952345
>> c1=double(int(((x-m(2))*(x-m(3))*(x-m(4))*(x-m(5))*(x-m(6))*(x-m(7))*(x-m(8))*(x-m(9))*(x-m(10))*(x-m(11)))/((m(1)-m(2))*(m(1)-m(3))*(m(1)-m(4))*(m(1)-m(5))*(m(1)-m(6))*(m(1)-m(7))*(m(1)-m(8))*(m(1)-m(9))*(m(1)-m(10))*(m(1)-m(11))),x,-1,1))  =   0.272925086777931

>> c2=double(int(((x-m(1))*(x-m(3))*(x-m(4))*(x-m(5))*(x-m(6))*(x-m(7))*(x-m(8))*(x-m(9))*(x-m(10))*(x-m(11)))/((m(2)-m(1))*(m(2)-m(3))*(m(2)-m(4))*(m(2)-m(5))*(m(2)-m(6))*(m(2)-m(7))*(m(2)-m(8))*(m(2)-m(9))*(m(2)-m(10))*(m(2)-m(11))),x,-1,1))  =   0.055668567116168

>> c3=double(int(((x-m(1))*(x-m(2))*(x-m(4))*(x-m(5))*(x-m(6))*(x-m(7))*(x-m(8))*(x-m(9))*(x-m(10))*(x-m(11)))/((m(3)-m(1))*(m(3)-m(2))*(m(3)-m(4))*(m(3)-m(5))*(m(3)-m(6))*(m(3)-m(7))*(m(3)-m(8))*(m(3)-m(9))*(m(3)-m(10))*(m(3)-m(11))),x,-1,1))  =   0.125580369464929

>> c4=double(int(((x-m(1))*(x-m(2))*(x-m(3))*(x-m(5))*(x-m(6))*(x-m(7))*(x-m(8))*(x-m(9))*(x-m(10))*(x-m(11)))/((m(4)-m(1))*(m(4)-m(2))*(m(4)-m(3))*(m(4)-m(5))*(m(4)-m(6))*(m(4)-m(7))*(m(4)-m(8))*(m(4)-m(9))*(m(4)-m(10))*(m(4)-m(11))),x,-1,1))   =   0.186290210927695

>> c5=double(int(((x-m(1))*(x-m(2))*(x-m(3))*(x-m(4))*(x-m(6))*(x-m(7))*(x-m(8))*(x-m(9))*(x-m(10))*(x-m(11)))/((m(5)-m(1))*(m(5)-m(2))*(m(5)-m(3))*(m(5)-m(4))*(m(5)-m(6))*(m(5)-m(7))*(m(5)-m(8))*(m(5)-m(9))*(m(5)-m(10))*(m(5)-m(11))),x,-1,1))   =   0.233193764592029

>> c6=double(int(((x-m(1))*(x-m(2))*(x-m(3))*(x-m(4))*(x-m(5))*(x-m(7))*(x-m(8))*(x-m(9))*(x-m(10))*(x-m(11)))/((m(6)-m(1))*(m(6)-m(2))*(m(6)-m(3))*(m(6)-m(4))*(m(6)-m(5))*(m(6)-m(7))*(m(6)-m(8))*(m(6)-m(9))*(m(6)-m(10))*(m(6)-m(11))),x,-1,1))   =   0.262804544510214
```

```
>> c7=double(int(((x-m(1))*(x-m(2))*(x-m(3))*(x-m(4))*(x-m(5))*(x-m(6))*(x-m(8))*(x-m(9))*(x-m(10))*(x-m(11)))/((m(7)-m(1))*(m(7)-m(2))*(m(7)-m(3))*(m(7)-m(4))*(m(7)-m(5))*(m(7)-m(6))*(m(7)-m(8))*(m(7)-m(9))*(m(7)-m(10))*(m(7)-m(11))),x,-1,1))   =   0.055668567116165

>> c8=double(int(((x-m(1))*(x-m(2))*(x-m(3))*(x-m(4))*(x-m(5))*(x-m(6))*(x-m(7))*(x-m(9))*(x-m(10))*(x-m(11)))/((m(8)-m(1))*(m(8)-m(2))*(m(8)-m(3))*(m(8)-m(4))*(m(8)-m(5))*(m(8)-m(6))*(m(8)-m(7))*(m(8)-m(9))*(m(8)-m(10))*(m(8)-m(11))),x,-1,1))   =   0.125580369464938

>> c9=double(int(((x-m(1))*(x-m(2))*(x-m(3))*(x-m(4))*(x-m(5))*(x-m(6))*(x-m(7))*(x-m(8))*(x-m(10))*(x-m(11)))/((m(9)-m(1))*(m(9)-m(2))*(m(9)-m(3))*(m(9)-m(4))*(m(9)-m(5))*(m(9)-m(6))*(m(9)-m(7))*(m(9)-m(8))*(m(9)-m(10))*(m(9)-m(11))),x,-1,1))   =   0.186290210927690

>> c10=double(int(((x-m(1))*(x-m(2))*(x-m(3))*(x-m(4))*(x-m(5))*(x-m(6))*(x-m(7))*(x-m(8))*(x-m(9))*(x-m(11)))/((m(10)-m(1))*(m(10)-m(2))*(m(10)-m(3))*(m(10)-m(4))*(m(10)-m(5))*(m(10)-m(6))*(m(10)-m(7))*(m(10)-m(8))*(m(10)-m(9))*(m(10)-m(11))),x,-1,1))   =   0.233193764592026

>> c11=double(int(((x-m(1))*(x-m(2))*(x-m(3))*(x-m(4))*(x-m(5))*(x-m(6))*(x-m(7))*(x-m(8))*(x-m(9))*(x-m(10)))/((m(11)-m(1))*(m(11)-m(2))*(m(11)-m(3))*(m(11)-m(4))*(m(11)-m(5))*(m(11)-m(6))*(m(11)-m(7))*(m(11)-m(8))*(m(11)-m(9))*(m(11)-m(10))),x,-1,1))   =   0.262804544510217
```

```
>> d=50;a=0;b=25;syms y  t

>> f=d*pi*(35-y)*(4*y^2/9); G=(subs(f,y,(1/2)*((b-a)*t+a+b)))*((1/2)*(b-a));

>>Trabajo_aprox=double(c1*subs(G,m(1))+c2*subs(G,m(2))+c3*subs(G,m(3))+c4*subs(G,m(4)) + c5*subs(G,m(5))+c6*subs(G,m(6))+c7*subs(G,m(7))+c8*subs(G,m(8))+c9*subs(G,m(9)) + c10*subs(G,m(10))+c11*subs(G,m(11)))   =    5.908666738522472e+006

>> Trabajo_exacto=double(int(f,y,a,b))   =    5.908666738522470e+006

>> error=abs(Trabajo_exacto-Trabajo_aprox)   =    1.862645149230957e-009
```

Emplee LA REGLA COMPUESTA DE SIMPSON, CON N = 14, para aproximar el volumen del sólido interior a: $x^2 + y^2 + z = 16$, $y^2 + x = 4$, en el primer octante, mediante integral doble, emplee dA = dxdy. Además obtenga el VALOR EXACTO de la integral y OBTENGA EL ERROR. EMPLEE QUINCE DECIMALES.

```
>> syms x  y

>> f=16-x^2-y^2;c=0;d=4-y^2;hx=(d-c)/14;a=0;b=2;hy=(b-a)/14;xo=c;x1=xo+hx;x2=x1+hx;x3=x2+hx;
x4=x3+hx;x5=x4+hx;x6=x5+hx; x7=x6+hx;x8=x7+hx;x9=x8+hx; x10=x9+hx;x11=x10+hx;
x12=x11+hx;x13=x12+hx;x14=d;

>> yo=a;y1=yo+hy;y2=y1+hy;y3=y2+hy;y4=y3+hy;y5=y4+hy;y6=y5+hy;y7=y6+hy;y8=y7+hy;y9=y8+hy;
y10=y9+hy;y11=y10+hy; y12=y11+hy;y13=y12+hy;y14=b;

>>
g=simplify((hx/3)*(subs(f,x,xo)+2*(subs(f,x,x2)+subs(f,x,x4)+subs(f,x,x6)+subs(f,x,x8)+subs(f,x,x10)+
subs(f,x,x12))+4*(subs(f,x,x1)+subs(f,x,x3)+subs(f,x,x5)+subs(f,x,x7)+subs(f,x,x9)+subs(f,x,x11) +
subs(f,x,x13))+subs(f,x,x14)))

g =    1/3*(-4+y^2)*(-32+y^4-5*y^2)


>>
volumen_aproximado=(hy/3)*(subs(g,y,yo)+2*(subs(g,y,y2)+subs(g,y,y4)+subs(g,y,y6)+subs(g,y,y8)+
subs(g,y,y10)+subs(g,y,y12))+4*(subs(g,y,y1)+subs(g,y,y3)+subs(g,y,y5)+subs(g,y,y7)+subs(g,y,y9)+
subs(g,y,y11)+subs(g,y,y13))+subs(g,y,y14))

volumen_aproximado =    61.562309301261621


>> volumen_exacto=int(int(f,x,c,d),y,a,b) =  6464/105

>> volumen_exato=double(int(int(f,x,c,d),y,a,b))

volumen_exato =    61.561904761904763


>> error=abs(volumen_exacto-volumen_aproximado)

error =     4.045393568574696e-04
```

Emplee LA REGLA COMPUESTA DE SIMPSON, CON N = 14, para aproximar:

$$\int_{\frac{\pi}{12}}^{\frac{\pi}{6}} \frac{x\cos(4x)}{\sqrt[9]{\left(2x-\frac{\pi}{3}\right)^5}}\,dx$$

Emplee quince decimales.

```
>> syms z

>> g=z*cos(4*z)/2^(5/9);a = -pi/6;b = -pi/12;

>> p=subs(g,a)+subs(diff(g,z),a)*(z-a)+(1/2)*subs(diff(g,z,2),a)*(z-a)^2+(1/6)*subs(diff(g,z,3),a)*(z-a)^3 +
(1/24)*subs(diff(g,z,4),a)*(z-a)^4;

>> G=(g-p)/(z-a)^(5/9);h=(b-a)/14;zo=a;z1=zo+h;z2=z1+h;z3=z2+h;z4=z3+h;z5=z4+h;z6=z5+h;z7=z6+h;
z8=z7+h;z9=z8+h;z10=z9+h;z11=z10+h;z12=z11+h;z13=z12+h;z14=b;

>> I1=(h/3)*(2*(subs(G,z2)+subs(G,z4)+subs(G,z6)+subs(G,z8)+subs(G,z10)+subs(G,z12))+4*(subs(G,z1)
+ subs(G,z3)+subs(G,z5)+subs(G,z7)+subs(G,z9)+subs(G,z11)+subs(G,z13))+subs(G,z14))

I1 =
  -6.533119588421008e-004

>> I2=double(int(p/(z-a)^(5/9),z,a,b))

I2 =
  0.092751476702050

>> I_aproximada=I1+I2

I_aproximada =
  0.092098164743208
```