Texto | Matemática | Dibujo | Plot | Animación

2D Input | Times New Roman | 12 | B I U

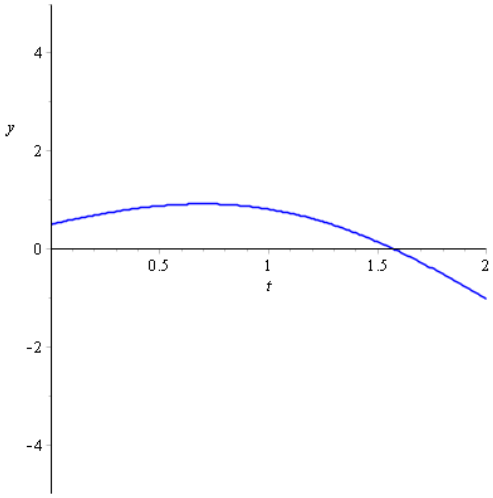
```
> restart :
  with(plots) :

  #Entrada de la ecuación diferencial a resolver.
  f := (x, z) → -tan(x)·z + cos(x);
  ecuacion := diff(y(t), t) + tan(t)·y(t) = cos(t) :
  condInit := y(0) = 0.5 :

  #Se obtiene solución exacta y se establecen los parámetros iniciales para RK.
  solExacta := rhs(dsolve({ecuacion, condInit}, y(t)));
  tf := 2 : ti := 0 : h := 0.1 : iter := 100 :
  x[0] := ti :
  z[0] := 0.5 :
   printf("\A continuación se imprime la solución exacta de la Ecuación Diferencial:") :

  grafy := plot(solExacta, t = ti ..tf, y = -5 ..5, color = blue) :
  display(grafy);



  #Cálculo de RK para las primeras 3 iteraciones del programa.
   for i from 0 to 2 do
  K1 := evalf(f(x[i], z[i])) :
  K2 := evalf(f(x[i] + h/2, z[i] + h·K1/2)) :
  K3 := evalf(f(x[i] + h/2, z[i] + h·K2/2)) :
  K4 := evalf(f(x[i] + h, z[i] + h·K3)) :
  ecu := evalf(z[i] + h/6·(K1 + 2·K2 + 2·K3 + K4)) :
  x[i + 1] := evalf(x[i] + h) :
  z[i + 1] := ecu :
   od:

  printf("Se muestran a continuación los primeros 3 cálculos utilizando RK:") :
  printf("\nPaso 1: ") :
  x[1];
  z[1];
  printf("\nPaso 2: ") :

  x[2];
  z[2];

  printf("\nPaso 3: ") :
  x[3];
  z[3];
```

```
printf("Iniciando el cálculo con Predictor-Corrector con el número de iteraciones especificado: \n\n") :

#Cálculo con Predictor-Corrector a partir del paso h=0.3.
for j from 3 to iter do
  Predictor[j+1] := z[j] + h/24 · (55 · f(x[j], z[j]) - 59 · f(x[j-1], z[j-1]) + 37 · f(x[j-2], z[j-2]) - 9 · f(x[j-3], z[j-3])) :
  Corrector[j+1] := z[j] + h/24 · (9 f(x[j+1], Predictor[j+1]) + 19 · f(x[j], z[j]) - 5 · f(x[j-1], z[j-1]) + f(x[j-2], z[j-2])) :
  z[j+1] := Corrector[j+1] :

  x[j+1] := evalf(x[j] + h) :

  printf("x=\t%f    y=\t%f\n", x[j], z[j])

  f(x[i], z[i])
od:

printf("\nFinalmente, se imprime la solución obtenida a partir de los puntos calculados y se compara con la solución obtenida: \n") :

w := (tf - ti)/h :
g1 := pointplot({seq([x[i], z[i]], i = 0 .. w)}) :

display(g1, grafy);
```

$$f := (x, z) \to -\tan(x)\, z + \cos(x)$$

$$solExacta := \frac{1}{2}\cos(t) + \cos(t)\, t$$

A continuación se imprime la solución exacta de la Ecuación Diferencial:



Se muestran a continuación los primeros 3 cálculos utilizando RK:

Paso 1:

0.1

0.5970024099

Paso 2:

0.2

0.6860464165

Paso 3:

0.3

0.7642688872

Iniciando el cálculo con Predictor-Corrector con el número de iteraciones especificado:

x=0.300000 y=0.764269
x=0.400000 y=0.828956
x=0.500000 y=0.877585
x=0.600000 y=0.907873
x=0.700000 y=0.917816
x=0.800000 y=0.905725
x=0.900000 y=0.870260
x=1.000000 y=0.810460
x=1.100000 y=0.725760
x=1.200000 y=0.616014
x=1.300000 y=0.481503
x=1.400000 y=0.322941
x=1.500000 y=0.141475
x=1.600000 y=-0.061313
x=1.700000 y=-0.283418
x=1.800000 y=-0.522495
x=1.900000 y=-0.775796
x=2.000000 y=-1.040240
x=2.100000 y=-1.312446
x=2.200000 y=-1.588774
x=2.300000 y=-1.865371
x=2.400000 y=-2.138219
x=2.500000 y=-2.403189
x=2.600000 y=-2.656098
x=2.700000 y=-2.892761
x=2.800000 y=-3.109053
x=2.900000 y=-3.300970
x=3.000000 y=-3.464682
x=3.100000 y=-3.596594
x=3.200000 y=-3.693399
x=3.300000 y=-3.752136
x=3.400000 y=-3.770234
x=3.500000 y=-3.745557
x=3.600000 y=-3.676453
x=3.700000 y=-3.561778
x=3.800000 y=-3.400936
x=3.900000 y=-3.193897
x=4.000000 y=-2.941212
x=4.100000 y=-2.644028
x=4.200000 y=-2.304087
x=4.300000 y=-1.923722
x=4.400000 y=-1.505842
x=4.500000 y=-1.053916
x=4.600000 y=-0.571940
x=4.700000 y=-0.064363
x=4.800000 y=0.463023

x=5.000000 y=1.557788
x=5.100000 y=2.113532
x=5.200000 y=2.666647
x=5.300000 y=3.210760
x=5.400000 y=3.739409
x=5.500000 y=4.246126
x=5.600000 y=4.724504
x=5.700000 y=5.168281
x=5.800000 y=5.571414
x=5.900000 y=5.928155
x=6.000000 y=6.233130
x=6.100000 y=6.481405
x=6.200000 y=6.668557
x=6.300000 y=6.790737
x=6.400000 y=6.844731
x=6.500000 y=6.828008
x=6.600000 y=6.738766
x=6.700000 y=6.575971
x=6.800000 y=6.339388
x=6.900000 y=6.029598
x=7.000000 y=5.648012
x=7.100000 y=5.196875
x=7.200000 y=4.679257
x=7.300000 y=4.099038
x=7.400000 y=3.460882
x=7.500000 y=2.770201
x=7.600000 y=2.033113
x=7.700000 y=1.256382
x=7.800000 y=0.447359
x=7.900000 y=-0.385957
x=8.000000 y=-1.235234
x=8.100000 y=-2.091951
x=8.200000 y=-2.947128
x=8.300000 y=-3.791639
x=8.400000 y=-4.616279
x=8.500000 y=-5.411860
x=8.600000 y=-6.169310
x=8.700000 y=-6.879783
x=8.800000 y=-7.534753
x=8.900000 y=-8.126117
x=9.000000 y=-8.646292
x=9.100000 y=-9.088304
x=9.200000 y=-9.445881
x=9.300000 y=-9.713527
x=9.400000 y=-9.886605
x=9.500000 y=-9.961393
x=9.600000 y=-9.935149
x=9.700000 y=-9.806156
x=9.800000 y=-9.573756
x=9.900000 y=-9.238381
x=10.000000 y=-8.801563

Finalmente, se imprime la solución obtenida a partir de los puntos calculados y se compara con la solución obtenida: