RELACIÓN MAXIMA TEMA 1

EJERCICIO 1

$\longrightarrow$ g(x):=if 0.3 <= x and x <= 0.5 then 2*x-log(x) else if 0.5 <= x and x <= 0.8 then 2/x + abs(x - 0.6) else if(x >= 0 and x <=1) then 0;

(% o2)

$$g(x) := \text{if } 0.3 <\,= x\,and\,x <\,= 0.5 \text{ then } 2x - \log(x)\,\text{else if } 0.5 <\,= x\,and\,x <\,= 0.8 \text{ then } \frac{2}{x} + |x - 0.6|$$

$$\text{else if } x >\,= 0\,and\,x <\,= 1 \text{ then } 0$$

$\longrightarrow$ integral: float(integrate(2*x - log(x), x, 0.3, 0.5));

rat: replaced 0.2 by 1/5 = 0.2rat: replaced 0.3 by 3/10 = 0.3rat: replaced 0.5 by 1/2 = 0.5

rat: replaced 0.2 by 1/5 = 0.2rat: replaced 0.2 by 1/5 = 0.2rat: replaced 0.3 by 3/10 = 0.3

rat: replaced 0.5 by 1/2 = 0.5rat: replaced 0.2 by 1/5 = 0.2rat: replaced 0.8 by 4/5 = 0.8

  rat: replaced 0.045 by 9/200 = 0.045rat: replaced 0.125 by 1/8 = 0.125

rat: replaced 0.2 by 1/5 = 0.2rat: replaced 0.3 by 3/10 = 0.3rat: replaced 0.5 by 1/2 = 0.5

rat: replaced 0.2 by 1/5 = 0.2rat: replaced 0.2 by 1/5 = 0.2rat: replaced 0.3 by 3/10 = 0.3

rat: replaced 0.5 by 1/2 = 0.5rat: replaced 0.2 by 1/5 = 0.2rat: replaced 0.7 by 7/10 = 0.7

rat: replaced -0.5108256237659908 by -21994011/43055810 = -0.5108256237659912

rat: replaced 0.6931471805599453 by 13614799/19642003 = 0.693147180559946

rat: replaced 1.203972804325936 by 24084703/20004358 = 1.203972804325937

rat: replaced 0.5108256237659908 by 21994011/43055810 = 0.5108256237659912

rat: replaced 0.5108256237659908 by 21994011/43055810 = 0.5108256237659912

rat: replaced 0.6931471805599453 by 13614799/19642003 = 0.693147180559946

rat: replaced 1.203972804325936 by 24084703/20004358 = 1.203972804325937

rat: replaced 0.5108256237659908 by 21994011/43055810 = 0.5108256237659912

rat: replaced -0.8465735902799727 by -16628401/19642003 = -0.8465735902799729

rat: replaced -0.6611918412977808 by -26789369/40516787 = -0.6611918412977811

(integral)   0.3453817489821919

$\longrightarrow$ integral:integral + float(integrate(2/x + abs(x - 0.6), x, 0.5, 0.8));

rat: replaced 0.3 by 3/10 = 0.3rat: replaced 0.5 by 1/2 = 0.5rat: replaced 0.8 by 4/5 = 0.8

rat: replaced 0.3 by 3/10 = 0.3rat: replaced -0.6 by -3/5 = -0.6

rat: replaced -0.6 by -3/5 = -0.6rat: replaced 0.6 by 3/5 = 0.6rat: replaced 0.3 by 3/10 = 0.3

rat: replaced 0.5 by 1/2 = 0.5rat: replaced 0.8 by 4/5 = 0.8rat: replaced 0.3 by 3/10 = 0.3

rat: replaced -0.6 by -3/5 = -0.6rat: replaced -0.6 by -3/5 = -0.6

rat: replaced -0.004999999999999997 by -1/200 = -0.005

rat: replaced 0.02000000000000001 by 1/50 = 0.02

rat: replaced 0.3 by 3/10 = 0.3rat: replaced 0.5 by 1/2 = 0.5

rat: replaced 0.8 by 4/5 = 0.8rat: replaced 0.3 by 3/10 = 0.3

rat: replaced 1.3 by 13/10 = 1.3rat: replaced 0.3 by 3/10 = 0.3

rat: replaced 0.5 by 1/2 = 0.5rat: replaced 0.8 by 4/5 = 0.8

rat: replaced 0.3 by 3/10 = 0.3

rat: replaced 0.3 by 3/10 = 0.3

rat: replaced 0.5 by 1/2 = 0.5

rat: replaced 0.8 by 4/5 = 0.8

rat: replaced 0.3 by 3/10 = 0.3

rat: replaced 0.9650072584914712 by 59875457/62046639 = 0.9650072584914712

(integral)   1.310389007473663
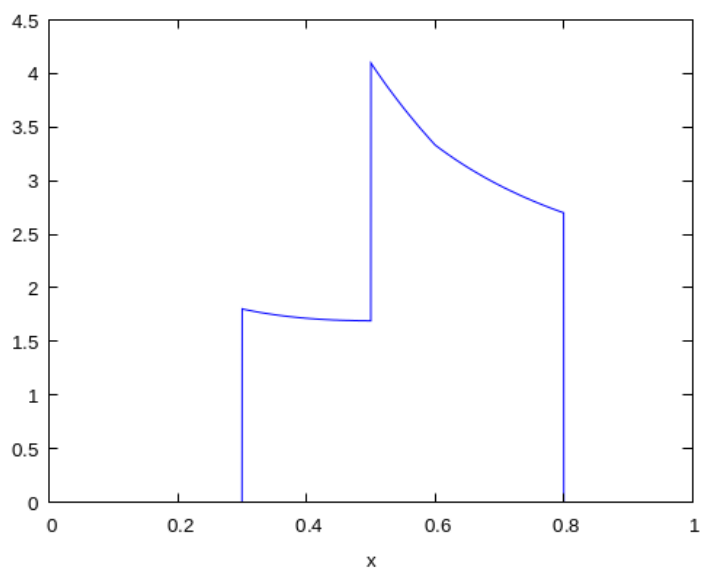
'

$\longrightarrow$ wxplot2d([g(x)], [x,0,1])\$

(% t4)

Ejercicio 2

→ A:genmatrix(lambda([i,j], abs(2*i-4*j)), 4, 4);

(A)
$$\begin{pmatrix} 2 & 6 & 10 & 14 \\ 0 & 4 & 8 & 12 \\ 2 & 2 & 6 & 10 \\ 4 & 0 & 4 & 8 \end{pmatrix}$$

→ v:eigenvalues(A)[1];

(v) $[\dfrac{376\left(\frac{\sqrt{3}\%i}{2}+\frac{-1}{2}\right)}{9\left(\frac{16\sqrt{6409}}{3^{\frac{3}{2}}}+\frac{9872}{27}\right)^{\frac{1}{3}}}+\left(\frac{16\sqrt{6409}}{3^{\frac{3}{2}}}+\frac{9872}{27}\right)^{\frac{1}{3}}\left(\frac{-1}{2}-\frac{\sqrt{3}\%i}{2}\right)+\frac{20}{3},$

$\left(\frac{16\sqrt{6409}}{3^{\frac{3}{2}}}+\frac{9872}{27}\right)^{\frac{1}{3}}\left(\frac{\sqrt{3}\%i}{2}+\frac{-1}{2}\right)+\frac{376\left(\frac{-1}{2}-\frac{\sqrt{3}\%i}{2}\right)}{9\left(\frac{16\sqrt{6409}}{3^{\frac{3}{2}}}+\frac{9872}{27}\right)^{\frac{1}{3}}}+\frac{20}{3},$

$\left(\frac{16\sqrt{6409}}{3^{\frac{3}{2}}}+\frac{9872}{27}\right)^{\frac{1}{3}}+\frac{376}{9\left(\frac{16\sqrt{6409}}{3^{\frac{3}{2}}}+\frac{9872}{27}\right)^{\frac{1}{3}}}+\frac{20}{3},0]$

→

→ radio_espectral:float(apply(max, abs(v)));

(radio_ espectral)   20.07783624796722

EJERCICIO 3

→ solucion:0;

(solucion)   0

→ for i:1 thru 23 do solucion:solucion+i^3;

(% o38)   *done*

→ solucion;

(% o40)   76176

→ apply("+", makelist(i^3, i, 1, 23));

(% o42)   76176

3

EJERCICIO 4

$\longrightarrow$ solucion_ 4:1;

(solucion_ 4)   1

$\longrightarrow$ for i:6 thru 19 do solucion_ 4:solucion_ 4/i;

(% o44)   *done*

$\longrightarrow$ solucion_ 4;

(% o45) $$\frac{1}{1013709170073600}$$

$\longrightarrow$ apply("*", makelist(1/i, i, 6, 19));

(% o46) $$\frac{1}{1013709170073600}$$

EJERCICIO 5

$\longrightarrow$ termino_ 1:1;

(termino_ 1)   1

$\longrightarrow$ termino_ 2:1;

(termino_ 2)   1

$\longrightarrow$ termino:0;

(termino)   0

$\longrightarrow$ for i:1 thru 41 do (termino:termino_ 1 + termino_ 2, termino_ 1:termino_ 2, termino_ 2: termino) ;

(% o25)   *done*

$\longrightarrow$ termino;

(% o26)   433494437

$\longrightarrow$ float$(((1+$sqrt$(5))$^43 - (1 - sqrt$(5))$^43)/(2^43*$sqrt$(5)))$;

(% o42) 4.3349443710^{8}

EJERCICIO 6

$\longrightarrow$ for i:1 thru 20 do print(float(sqrt(5.0+10^(-i)) - sqrt(5.0)));

0.02224998062745298

0.00223495106014937

2.23595618527916410^{-4}

2.23605679723348710^{-5}

2.23606685922916910^{-6}

2.2360678642030510^{-7}

2.23606795302089210^{-8}

2.23606777538520810^{-9}

$2.23606910765283810^{-10}$

$2.23607798943703510^{-11}$

$2.23598917159506510^{-12}$

$2.23376872554581510^{-13}$

$2.22044604925031310^{-14}$

$2.22044604925031310^{-15}$

0.0

0.0

0.0

0.0

0.0

0.0

(% o46) *done*

$\longrightarrow$ for i:1 thru 20 do print(float((10^(-i))/(sqrt(5 + 10^(-i)) + sqrt(5))));

0.02224998062745328

5

$$0.002234951060149439$$

$$2.235956185279857 \cdot 10^{-4}$$

$$2.236056797271703 \cdot 10^{-5}$$

$$2.236066859466919 \cdot 10^{-6}$$

$$2.236067865696401 \cdot 10^{-7}$$

$$2.23606796631945 \cdot 10^{-8}$$

$$2.236067976381755 \cdot 10^{-9}$$

$$2.236067977387987 \cdot 10^{-10}$$

$$2.236067977488609 \cdot 10^{-11}$$

$$2.236067977498672 \cdot 10^{-12}$$

$$2.236067977499677 \cdot 10^{-13}$$

$$2.23606797749978 \cdot 10^{-14}$$

$$2.236067977499788 \cdot 10^{-15}$$

$$2.236067977499791 \cdot 10^{-16}$$

$$2.236067977499789 \cdot 10^{-17}$$

$$2.236067977499791 \cdot 10^{-18}$$

$$2.23606797749979 \cdot 10^{-19}$$

$$2.236067977499792 \cdot 10^{-20}$$

$$2.236067977499789 \cdot 10^{-21}$$

(% o47)   *done*

En el primero se hace una diferencia de valores muy cercanos y como el ordenador trabaja con números máquina, losredondea a 0, y como en la segunda forma no se hace la diferencia no lo redondea a 0. EJERCICIO 7

$\longrightarrow$ A: genmatrix(lambda([i,j], 2*i - abs(j)), 3, 3);

(A)
$$\begin{pmatrix} 1 & 0 & -1 \\ 3 & 2 & 1 \\ 5 & 4 & 3 \end{pmatrix}$$

$\longrightarrow$ n:matrix_size(A)[1];

(n)   3

$\longrightarrow$ v:makelist(apply("+", abs(transpose(A)[i])), i, 1, n);

(v) $$[9, 6, 5]$$

$\longrightarrow$ norma_1: apply(max, v);

(norma_ 1) $$9$$

EJERCICIO 8

$\longrightarrow$ A:matrix([1,0,3],[1,2,0],[3,0,-5]);

(A) $$\begin{pmatrix} 1 & 0 & 3 \\ 1 & 2 & 0 \\ 3 & 0 & -5 \end{pmatrix}$$

$\longrightarrow$ n:matrix_size(A)[1];

(n) $$3$$

$\longrightarrow$ v:makelist(apply("+", abs(A[i])), i, 1, n);

(v) $$[4, 3, 8]$$

$\longrightarrow$ v_inv:makelist(apply("+", abs(invert(A)[i])), i, 1, n);

(v_ inv) $$[\frac{4}{7}, \frac{11}{14}, \frac{2}{7}]$$

$\longrightarrow$ if (determinant(A)=0) then print ("La matriz no es regular") else norma:apply(max, v);

(% o10) $$8$$

$\longrightarrow$ if (determinant(A) $\neq$ 0) then norma_inv:apply(max, v_inv);

(% o18) $$\frac{11}{14}$$

$\longrightarrow$ condicionamiento:norma_inv*norma;

(condicionamiento) $$\frac{44}{7}$$

EJERCICIO 9

$\longrightarrow$ A: genmatrix(lambda([i,j], i/(i+j+1)), 2, 4);

(A) $$\begin{pmatrix} \frac{1}{3} & \frac{1}{4} & \frac{1}{5} & \frac{1}{6} \\ \frac{1}{2} & \frac{2}{5} & \frac{1}{3} & \frac{2}{7} \end{pmatrix}$$

$\longrightarrow$ At:transpose(A);

(At) $$\begin{pmatrix} \frac{1}{3} & \frac{1}{2} \\ \frac{1}{4} & \frac{2}{5} \\ \frac{1}{5} & \frac{1}{3} \\ \frac{1}{6} & \frac{2}{7} \end{pmatrix}$$

$\longrightarrow$ v:eigenvalues(At.A)[1];

(v) $$[-\frac{\sqrt{22126530049} - 148905}{352800}, \frac{\sqrt{22126530049} + 148905}{352800}, 0]$$

$\longrightarrow$ radio_espectral:apply(max, abs(v));

(radio_ espectral) $$\frac{\sqrt{22126530049} + 148905}{352800}$$

$\longrightarrow$ norma_eucl:float(sqrt(radio_espectral));

(norma_ eucl)   0.9185276269534124