

3. Aproxime  $f(1.3675)$  a partir de los siguientes datos:

<b>x</b>	<b>1.27</b>	<b>1.29</b>	<b>1.31</b>	<b>1.33</b>	<b>1.35</b>	<b>1.37</b>
<b>F(x)</b>	<b>13.270567</b>	<b>13.781763</b>	<b>14.307413</b>	<b>14.847887</b>	<b>15.403567</b>	<b>15.974842</b>

Además, calcule el valor exacto y el error de aproximación si la función es:  $f(x) = 3xe^x - \cos(x)$

Para encontrar el valor de  $f(1.3675)$  ejecutaremos el script en Matlab, insertando los valores de X y f(x)

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>> Lagrange
INTERPOLACIÓN Y POLINOMIO DE LAGRANGE
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Valor a interpolar x: 1.3675
Datos [X0 X1 X2 ... Xn]: [1.27 1.29 1.31 1.33 1.35 1.37]
Valores de la función:
    1-Utilizar una función.
    2-Ingresa valores
Opción: 2
Valores F(x) [F(X0) F(X1) ... F(Xn)]: [13.270567 13.781763 14.307413 14.847887 15.403567 15.974842]
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Los resultados obtenidos son:

El valor aproximado para  $f(1.3675) = 15.902566400768277$

Grado del Polinomio: 5

Obteniendo las Funciones de Lagrange

$L_0(x) = \frac{(x-1.2900000000000000)(x-1.3100000000000000)(x-1.3300000000000000)(x-1.3500000000000000)(x-1.3700000000000000)}{(1.2700000000000000-1.2900000000000000)(1.2700000000000000-1.3100000000000000)(1.2700000000000000-1.3300000000000000)(1.2700000000000000-1.3500000000000000)(1.2700000000000000-1.3700000000000000)}$

$L_0(1.3675000000000000) = 0.019039154052735$

$L_1(x) = \frac{(x-1.2700000000000000)(x-1.3100000000000000)(x-1.3300000000000000)(x-1.3500000000000000)(x-1.3700000000000000)}{(1.2900000000000000-1.2700000000000000)(1.2900000000000000-1.3100000000000000)(1.2900000000000000-1.3300000000000000)(1.2900000000000000-1.3500000000000000)(1.2900000000000000-1.3700000000000000)}$

$L_1(1.3675000000000000) = -0.119762420654303$

$L_2(x) = \frac{(x-1.2700000000000000)(x-1.2900000000000000)(x-1.3300000000000000)(x-1.3500000000000000)(x-1.3700000000000000)}{(1.3100000000000000-1.2700000000000000)(1.3100000000000000-1.2900000000000000)(1.3100000000000000-1.3300000000000000)(1.3100000000000000-1.3500000000000000)(1.3100000000000000-1.3700000000000000)}$

$L_2(1.3675000000000000) = 0.322837829589860$

$L_3(x) = \frac{(x-1.2700000000000000)(x-1.2900000000000000)(x-1.3100000000000000)(x-1.3500000000000000)(x-1.3700000000000000)}{(1.3300000000000000-1.2700000000000000)(1.3300000000000000-1.2900000000000000)(1.3300000000000000-1.3100000000000000)(1.3300000000000000-1.3500000000000000)(1.3300000000000000-1.3700000000000000)}$

$L_3(1.3675000000000000) = -0.495018005371119$

$L_4(x) = \frac{(x-1.2700000000000000)(x-1.2900000000000000)(x-1.3100000000000000)(x-1.3300000000000000)(x-1.3700000000000000)}{(1.3500000000000000-1.2700000000000000)(1.3500000000000000-1.2900000000000000)(1.3500000000000000-1.3100000000000000)(1.3500000000000000-1.3300000000000000)(1.3500000000000000-1.3700000000000000)}$

$L_4(1.3675000000000000) = 0.530376434326201$

$L_5(x) = \frac{(x-1.2700000000000000)(x-1.2900000000000000)(x-1.3100000000000000)(x-1.3300000000000000)(x-1.3500000000000000)}{(1.3700000000000000-1.2700000000000000)(1.3700000000000000-1.2900000000000000)(1.3700000000000000-1.3100000000000000)(1.3700000000000000-1.3300000000000000)(1.3700000000000000-1.3500000000000000)}$

$L_5(1.3675000000000000) = 0.742527008056625$

Polinomio:

$P_5(x) = L_0(x)*F(X_0) + L_1(x)*F(X_1) + L_2(x)*F(X_2) + L_3(x)*F(X_3) + L_4(x)*F(X_4) + L_5(x)*F(X_5)$

$P_5(1.3675000000000000) = (0.019039154052735)*(13.270567000000000) + (-0.119762420654303)*(13.781763000000000) + (0.322837829589860)*(14.300000000000000) + (-0.495018005371119)*(14.800000000000000) + (0.530376434326201)*(15.300000000000000) + (0.742527008056625)*(15.800000000000000)$

$P_5(1.3675000000000000) = 15.902566400768277$

Ahora encontraremos el valor exacto y el error de aproximacion para  $f(x) = 3xe^x - \cos(x)$

En matlab ingresado como:  $3 * x * \exp(x) - \cos(x)$

El valor exacto de la funcion es:  $15.902565832686312$  y el erro:  $8.226104e - 11$

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>> Lagrange
INTERPOLACIÓN Y POLINOMIO DE LAGRANGE
-----
Valor a interpolar x: 1.3675
Datos [X0 X1 X2 ... Xn]: [1.27 1.29 1.31 1.33 1.35 1.37]
Valores de la función:
    1-Utilizar una función.
    2-Ingresa valores
Opción: 1
Función f(x): 3*x*exp(x)-cos(x)
Valores de F(x): 13.270567,13.781763,14.307413,14.847887,15.403567,15.974842,

Command Window
Grado del Polinomio: 5

Obteniendo las Funciones de Lagrange
L0(x)=
    (x-1.290000000000000)(x-1.310000000000000)(x-1.330000000000000)(x-1.350000000000000)(x-1.370000000000000)
    (1.270000000000000-1.290000000000000)(1.270000000000000-1.310000000000000)(1.270000000000000-1.330000000000000)(1.270000000000000-1.350000000000000)(1.270000000000000-1.370000000000000)
L0(1.367500000000000)=0.019039154052735

L1(x)=
    (x-1.270000000000000)(x-1.310000000000000)(x-1.330000000000000)(x-1.350000000000000)(x-1.370000000000000)
    (1.290000000000000-1.270000000000000)(1.290000000000000-1.310000000000000)(1.290000000000000-1.330000000000000)(1.290000000000000-1.350000000000000)(1.290000000000000-1.370000000000000)
L1(1.367500000000000)=-0.119762420654303

L2(x)=
    (x-1.270000000000000)(x-1.290000000000000)(x-1.330000000000000)(x-1.350000000000000)(x-1.370000000000000)
    (1.310000000000000-1.270000000000000)(1.310000000000000-1.290000000000000)(1.310000000000000-1.330000000000000)(1.310000000000000-1.350000000000000)(1.310000000000000-1.370000000000000)
L2(1.367500000000000)=0.322837829589860

L3(x)=
    (x-1.270000000000000)(x-1.290000000000000)(x-1.310000000000000)(x-1.350000000000000)(x-1.370000000000000)
    (1.330000000000000-1.270000000000000)(1.330000000000000-1.290000000000000)(1.330000000000000-1.310000000000000)(1.330000000000000-1.350000000000000)(1.330000000000000-1.370000000000000)
L3(1.367500000000000)=-0.495018005371119

L4(x)=
    (x-1.270000000000000)(x-1.290000000000000)(x-1.310000000000000)(x-1.330000000000000)(x-1.370000000000000)
    (1.350000000000000-1.270000000000000)(1.350000000000000-1.290000000000000)(1.350000000000000-1.310000000000000)(1.350000000000000-1.330000000000000)(1.350000000000000-1.370000000000000)
L4(1.367500000000000)=0.530376434326201

L5(x)=
    (x-1.270000000000000)(x-1.290000000000000)(x-1.310000000000000)(x-1.330000000000000)(x-1.350000000000000)
    (1.370000000000000-1.270000000000000)(1.370000000000000-1.290000000000000)(1.370000000000000-1.310000000000000)(1.370000000000000-1.330000000000000)(1.370000000000000-1.350000000000000)
L5(1.367500000000000)=0.742527008056625

Polinomio:
P5(x)=L0(x)*F(X0) + L1(x)*F(X1) + L2(x)*F(X2) + L3(x)*F(X3) + L4(x)*F(X4) + L5(x)*F(X5)
P5(1.367500000000000)=(0.019039154052735)*(13.270567389649214) + (-0.119762420654303)*(13.781763095706813) + (0.322837829589860)*(14.30741314847887) + (-0.495018005371119)*(14.84788715403567) + (0.530376434326201)*(15.40356715974842) + (0.742527008056625)*(15.97484216484216)
P5(1.367500000000000)= 15.902565832768573

Valor Exacto de la Función: 15.902565832686312
Error: 8.226104e-11

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