Examen Tercer Parcial

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1. *Aproxima $f(8.4)$ por medio del polinomio interpolante de Lagrange de orden 2, sabiendo que:*

$$f(8.1) = 16.944410$$
$$f(8.3) = 17.56492$$
$$f(8.6) = 18.50515$$

Además, escribe el polinomio interpolante.

```
f, e = Lagrange(xInput, yInput), 8.4
print("\ng(", e, ") ≈ ", N(f.subs(x, e)), sep = "")
```

```
3 points:
        f(8.1) = 16.94441
        f(8.3) = 17.56492
        f(8.6) = 18.50515

Polynomial
16.94441*(x - 8.3)/(8.1 - 8.3)*(x - 8.6)/(8.1 - 8.6) + 17.56492*(x - 8.1)/(8.3 - 8.1)*(x - 8.6)/(8.3 - 8.6) + 18.50515*(x
- 8.1)/(8.6 - 8.1)*(x - 8.3)/(8.6 - 8.3)

Simplified
0.0631000000000768*x**2 + 2.06770999999844*x - 3.94403199999579

By Powers
0.0631000000000768*x**2 + 2.06770999999844*x - 3.94403199999579

g(8.4) ≈ 17.8770679999965
```

2. *Escribe el polinomio de Taylor de orden 3 que aproxime a la función:*

$$y = \frac{e^x + e^{-x}}{2}$$

alrededor de $x = 0$.

```
f = Taylor(expression, 3, 0)
print("\ng(x) =", f, "\n")
#print("f(x) ≈", N(f.subs(x, 2.1)))
```

```
        f(x) =   exp(x)/2 + exp(-x)/2
        f'(x) =  exp(x)/2 - exp(-x)/2
        f''(x) =         exp(x)/2 + exp(-x)/2
        f'''(x) =        exp(x)/2 - exp(-x)/2

g(x) = 1.00000000000000*(x - 0)**0/(0!) + 0*(x - 0)**1/(1!) + 1.00000000000000*(x - 0)**2/(2!) + 0*(x - 0)**3/(3!)

g(x) = 0.5*x**2 + 1.0
```

3. *Considera la siguiente matriz y encuentra el polinomio característico usando el método de Faddev*.

$$\begin{pmatrix} 3 & 2 & 4 \\ 2 & 0 & 2 \\ 4 & 2 & 3 \end{pmatrix}$$

```
Leverrier_Faddeev(matrix)
```

```
Matrix:

 [[3 2 4]
 [2 0 2]
 [4 2 3]]
```

```
'1.0*λ^3 + -6.0*λ^2 + -15.0*λ^1 + -8.0*λ^0'
```

4. *Aproxima la raíz de la siguiente función usando Newton Raphson:*

$$f(x) = x^2 - 6$$

Considera $p_o = 1$.

```
NewtonRaphson(1, 0.001, 50)
```

```
        f(x) = x**2 - 6
        f'(x) = 2*x

1. P = 3.50000000000000         Er = 71.4285714285714
2. P = 2.60714285714286         Er = 34.2465753424658
3. P = 2.45425636007828         Er = 6.22944283863252
4. P = 2.44949437160697         Er = 0.194406997889468
5. P = 2.44948974278755         Er = 0.000188970761244172

2.44948974278755
```

5. *Realiza la siguiente operación* $10_{10} - 4_{10}$. *Convierte a binario (8 bits) y realiza la operación en binario usando complemento a 2, comprueba tu resultado.*

$$10_{10} = 00001010_2$$
$$4_{10} = 00000100_2$$
$$C_2(-4) = 11111100_2$$

$$10_{10} - 4_{10}$$
$$= \ 00001010_2 - 00000100_2$$
$$= 00001010_2 + 11111100_2$$

$$\begin{array}{r} 00001010_2 \\ +\ 11111100_2 \\ \hline \not{1}00000110_2 \end{array}$$

$$\mathbf{10_{10} - 4_{10} = 00000110_2 = 6_{10}}$$

6. *Aproxima las soluciones del siguiente PVI:*

$$y' = te^{3t} - 2y$$

Sujeto a $y(0) = 0$ *con* $0 \leq t \leq 1$ *y con* $n = 10$.
Usa el método de Euler.

```
: Euler(yp, a, b, n, c)
```

```
         f(x) = t*exp(3*t) - 2*y

0        0
0.1      0
0.2      0.0134985880757600
0.30000000000000004      0.0472412464684182
0.4      0.111581090509443
0.5      0.222069549317016
0.6      0.401740092970516
0.7      0.684370922241190
0.7999999999999999       1.11912863167269
0.8999999999999999       1.77715701578948
```

```
: (0.9999999999999999, 2.76090146787014)
```