Universidad de Carabobo - Facultad de Ingenieria - Direccion de Postgrado
Programa: Maestria Matematica y Computacion - **Asignatura**: Introduccion al Calculo
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Titulo: Asignacion - **Parte 2)** Derivadas Implicitas

```
> restart:
```

Ejercicio 2.1 $x+y^2+y\sin(x)=y^3+\pi$

```
> f1:=x->x+y^2+y*sin(x)=(y)^(3)+Pi;
```

$$f1 := x \rightarrow x+y^2+y\sin(x)=y^3+\pi \tag{1.1}$$

1ra manera de obtener la derivada implicita:

```
> dy/dx=implicitdiff(x+y^2+y*sin(x)=(y)^(3)+Pi,y,x);
```

$$\frac{dy}{dx}=\frac{1+y\cos(x)}{3y^2-2y-\sin(x)} \tag{1.2}$$

2da manera de obtener la derivada implicita:

```
> dimp1:=implicitdiff(f1(x),y,x);
```

$$dimp1 := \frac{1+y\cos(x)}{3y^2-2y-\sin(x)} \tag{1.3}$$

Se simplifica (si es posible), la expresion resultante de la derivada implicita.

```
> simplify(%);
```

$$-\frac{1+y\cos(x)}{-3y^2+\sin(x)+2y} \tag{1.4}$$

Para encontrar la pendiente, se evalua el puno (π,1), en la ecuacion resultante de la derivada implicita:

```
> eval(dimp1,[x=Pi, y=1]); #Se sustituyen ambos valores, de x y
  el de y
```

$$0 \tag{1.5}$$

Ejercicio 2.2 $\dfrac{x+\sqrt{y}}{y+\sqrt{x}}=\dfrac{3y-9x}{x+y}$

```
> f2:=x->(x+sqrt(y))/(y+sqrt(x))=((3*y -9*x))/(x+y);
```

$$f2 := x \rightarrow \frac{x+\sqrt{y}}{y+\sqrt{x}}=\frac{3y-9x}{x+y} \tag{2.1}$$

1ra manera de obtener la derivada implicita:

```
> dy/dx=implicitdiff((x+sqrt(y))/(y+sqrt(x))=((3*y -9*x))/(x+y),
  y,x);
```

$$\frac{dy}{dx}=-\left(-26y^{7/2}\sqrt{x}-4y^{5/2}x^{3/2}-2y^{3/2}x^{5/2}-49y^{5/2}x-24y^{3/2}x^{3/2}-2y^{3/2}x^2-\sqrt{y}\,x^3+y^3+2y^2x+yx^2\right)\Big/\left(26y^{5/2}x^{3/2}+2y^2x^{3/2}+48y^{3/2}x^2+4y^{3/2}x^{5/2}+y^3\sqrt{x}+yx^{5/2}+24\sqrt{y}\,x^{5/2}+2\sqrt{y}\,x^{7/2}-2yx^2-y^2x-x^3\right) \tag{2.2}$$

2da manera de obtener la derivada implicita:

```
> dimp2:=implicitdiff(f2(x),y,x);
```

$$dimp2 := -\left(-26y^{7/2}\sqrt{x}-4y^{5/2}x^{3/2}-2y^{3/2}x^{5/2}-49y^{5/2}x-24y^{3/2}x^{3/2}-2y^{3/2}x^2\right. \tag{2.3}$$

$$-\sqrt{y}\,x^3+y^3+2\,y^2\,x+y\,x^2\Big)\Big/\Big(26\,y^{5/2}\,x^{3/2}+2\,y^2\,x^{3/2}+48\,y^{3/2}\,x^2+4\,y^{3/2}\,x^{5/2}+y^3\sqrt{x}+y\,x^{5/2}+24\sqrt{y}\,x^{5/2}+2\sqrt{y}\,x^{7/2}-2\,y\,x^2-y^2\,x-x^3\Big)$$

Se simplifica (si es posible), la expresion resultante de la derivada implicita.

```
> simplify(%);
```

$$\Big(26\,y^{7/2}\sqrt{x}+4\,y^{5/2}\,x^{3/2}+2\,y^{3/2}\,x^{5/2}+49\,y^{5/2}\,x+24\,y^{3/2}\,x^{3/2}+2\,y^{3/2}\,x^2+\sqrt{y}\,x^3-y^3-2\,y^2\,x-y\,x^2\Big)\Big/\Big(26\,y^{5/2}\,x^{3/2}+2\,y^2\,x^{3/2}+48\,y^{3/2}\,x^2+4\,y^{3/2}\,x^{5/2}+y^3\sqrt{x}+y\,x^{5/2}+24\sqrt{y}\,x^{5/2}+2\sqrt{y}\,x^{7/2}-2\,y\,x^2-y^2\,x-x^3\Big) \quad \textbf{(2.4)}$$

Para encontrar la pendiente, se evalua el puno (1,4), en la ecuacion resultante de la derivada implicita.

```
> eval(dimp2,[x=1, y=4]); #Se sustituyen ambos valores, de x y y
```

$$-\frac{-2625\sqrt{4}+100}{650\sqrt{4}+75} \quad \textbf{(2.5)}$$

```
> evalf(%,4); #Valor numerico de la pendiente
```

$$3.745 \quad \textbf{(2.6)}$$

Ejercicio 2.3 $x+y^5+1=y+x^4+x\,y^2$

```
> f3:=x->(x+(y)^(5)+1= y +(x)^(4)+x*y^2);
```

$$f3:=x\rightarrow x+y^5+1=y+x^4+x\,y^2 \quad \textbf{(3.1)}$$

1ra manera de obtener la derivada implicita de segundo orden:

```
> der_imp_orden2_ej3=implicitdiff((x+(y)^(5)+1= y +(x)^(4)+x*
  y^2),y,x,x); #1ra Manera de obtener derivada implicita de
  segundo orden;
```

$$der\_imp\_orden2\_ej3=\Big(2\,\big(150\,x^2\,y^8-160\,x^6\,y^3-160\,x^3\,y^5+16\,x^7+16\,x^4\,y^2+80\,x^3\,y^3-60\,x^2\,y^4-3\,x\,y^4+10\,y^5-8\,x^4+16\,x^3\,y+2\,x\,y^2-12\,y^3+6\,x^2+x+2\,y\big)\Big)\Big/\Big(125\,y^{12}-150\,x\,y^9+60\,x^2\,y^6-75\,y^8-8\,x^3\,y^3+60\,x\,y^5-12\,x^2\,y^2+15\,y^4-6\,x\,y-1\Big) \quad \textbf{(3.2)}$$

2da manera de obtener la derivada implicita de segundo orden:

```
> d2imp_ej3:=implicitdiff(f3(x),y,x,x);
```

$$d2imp\_ej3:=\Big(2\,\big(150\,x^2\,y^8-160\,x^6\,y^3-160\,x^3\,y^5+16\,x^7+16\,x^4\,y^2+80\,x^3\,y^3-60\,x^2\,y^4-3\,x\,y^4+10\,y^5-8\,x^4+16\,x^3\,y+2\,x\,y^2-12\,y^3+6\,x^2+x+2\,y\big)\Big)\Big/\Big(125\,y^{12}-150\,x\,y^9+60\,x^2\,y^6-75\,y^8-8\,x^3\,y^3+60\,x\,y^5-12\,x^2\,y^2+15\,y^4-6\,x\,y-1\Big) \quad \textbf{(3.3)}$$

Se simplifica (si es posible), la expresion resultante de la derivada implicita de segundo orden:

```
> simplify(%);
```

$$-\Big(2\,\big(150\,x^2\,y^8-160\,x^6\,y^3-160\,x^3\,y^5+16\,x^7+16\,x^4\,y^2+80\,x^3\,y^3-60\,x^2\,y^4-3\,x\,y^4+10\,y^5-8\,x^4+16\,x^3\,y+2\,x\,y^2-12\,y^3+6\,x^2+x+2\,y\big)\Big)\Big/\Big(-125\,y^{12}+150\,x\,y^9-60\,x^2\,y^6+75\,y^8+8\,x^3\,y^3-60\,x\,y^5+12\,x^2\,y^2-15\,y^4+6\,x\,y+1\Big) \quad \textbf{(3.4)}$$

Se evalua el punto (1,1), en la ecuacion resultante de la derivada implicita de segundo orden

```
> eval(d2imp_ej3,[x=1,y=1]);
```

$$-26 \quad \textbf{(3.5)}$$

Ejercicio 2.4 $x^3\,y+x\,y^3=11$

```
> f4:=x->((x)^(3)*(y)+ x*y^3 = 11);
```

$$f4 := x \rightarrow x^3\, y + x\, y^3 = 11 \tag{4.1}$$

1ra manera de obtener la derivada implicita de tercer orden:

```
> der_imp_orden3_ej4=implicitdiff(x^(3)*y+ x*y^3= 11,y,x,x,x);
  #1ra Manera de obtener derivada implicita de tercer orden;
```

$$der\_imp\_orden3\_ej4 = -\frac{12\,\left(5\,x^{10} - 63\,x^8\,y^2 - 54\,x^6\,y^4 + 42\,x^4\,y^6 + 49\,x^2\,y^8 + 21\,y^{10}\right)\,y}{\left(x^{10} + 15\,x^8\,y^2 + 90\,x^6\,y^4 + 270\,x^4\,y^6 + 405\,x^2\,y^8 + 243\,y^{10}\right)\,x^3} \tag{4.2}$$

2da manera de obtener la derivada implicita de tercer orden:

```
> d3imp_ej4:=implicitdiff(f4(x),y,x,x,x);
```

$$d3imp\_ej4 := -\frac{12\,\left(5\,x^{10} - 63\,x^8\,y^2 - 54\,x^6\,y^4 + 42\,x^4\,y^6 + 49\,x^2\,y^8 + 21\,y^{10}\right)\,y}{\left(x^{10} + 15\,x^8\,y^2 + 90\,x^6\,y^4 + 270\,x^4\,y^6 + 405\,x^2\,y^8 + 243\,y^{10}\right)\,x^3} \tag{4.3}$$

Se simplifica (si es posible), la expresion resultante de la derivada implicita de segundo orden:

```
> simplify(%);
```

$$-\frac{12\,\left(5\,x^{10} - 63\,x^8\,y^2 - 54\,x^6\,y^4 + 42\,x^4\,y^6 + 49\,x^2\,y^8 + 21\,y^{10}\right)\,y}{\left(x^{10} + 15\,x^8\,y^2 + 90\,x^6\,y^4 + 270\,x^4\,y^6 + 405\,x^2\,y^8 + 243\,y^{10}\right)\,x^3} \tag{4.4}$$

Se evalua el punto (1,2), en la ecuacion resultante de la derivada implicita de tercer orden

```
> eval(d3imp_ej4,[x=1,y=2]);
```

$$-\frac{855000}{371293} \tag{4.5}$$

```
> evalf(%,4); # Valor numerico del punto (1,2) en la derivada
  implicita de tercer orden
```

$$-2.303 \tag{4.6}$$