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 1)** Calcular y simplificar derivadas

```
> restart:
```

Ejercicio 1.1 $y=\sqrt{x^2+1}+\dfrac{1}{(x^2+1)^{3/2}}$

1ra manera de obtener la derivada:

```
> f1:=x->(sqrt(x^2+1)+(1)/((x^2+1))^((3)/(2)));
  D((f1));
```

$$f1 := x \rightarrow \sqrt{x^2+1}+\frac{1}{(x^2+1)^{3/2}}$$

$$x \rightarrow \frac{x}{\sqrt{x^2+1}}-\frac{3\,x}{(x^2+1)^{5/2}} \tag{1.1}$$

2da manera de obtener derivada:

```
> df1:= diff(f1(x),x);
```

$$df1 := \frac{x}{\sqrt{x^2+1}}-\frac{3\,x}{(x^2+1)^{5/2}} \tag{1.2}$$

Se simplifica la expresion resultante de la derivada

```
> simplify(df1);
```

$$\frac{x\,(x^4+2\,x^2-2)}{(x^2+1)^{5/2}} \tag{1.3}$$

Ejercicio 1.2 $y=\dfrac{(x^2-1)\,(x^2-4)\,(x^2-9)}{x^6}$

1ra manera de obtener la derivada:

```
> f2:=x->((((x)^(2)-1))*((x)^(2)-4)*((x)^(2)-9)/((x))^(6));
  D((f2));
```

$$f2 := x \rightarrow \frac{(x^2-1)\,(x^2-4)\,(x^2-9)}{x^6}$$

$$x \rightarrow \frac{2\,(x^2-4)\,(x^2-9)}{x^5}+\frac{2\,(x^2-1)\,(x^2-9)}{x^5}+\frac{2\,(x^2-1)\,(x^2-4)}{x^5}-\frac{6\,(x^2-1)\,(x^2-4)\,(x^2-9)}{x^7} \tag{2.1}$$

2da manera de obtener derivada:

```
> df2:= diff(f2(x),x);
```

$$df2 := \frac{2\,(x^2-4)\,(x^2-9)}{x^5}+\frac{2\,(x^2-1)\,(x^2-9)}{x^5}+\frac{2\,(x^2-1)\,(x^2-4)}{x^5} \tag{2.2}$$

$$-\frac{6\left(x^2-1\right)\left(x^2-4\right)\left(x^2-9\right)}{x^7}$$

Se simplifica la expresion resultante de la derivada

```
> simplify(df2);
```

$$\frac{4\left(7x^4-49x^2+54\right)}{x^7} \qquad (2.3)$$

Ejercicio 1.3 $y=(t+1)\left(t^2+2\right)\left(t^3+3\right)\left(t^4+4\right)\left(t^5+5\right)$

1ra manera de obtener la derivada:

```
> f3:=t->((t+1))*((t)^(2)+2)*((t)^(3)+3)*((t)^(4)+4)*((t)^(5)+5);
  D((f3));
```

$$f3 := t \to (t+1)\left(t^2+2\right)\left(t^3+3\right)\left(t^4+4\right)\left(t^5+5\right)$$

$$t \to \left(t^2+2\right)\left(t^3+3\right)\left(t^4+4\right)\left(t^5+5\right)+2(t+1)t\left(t^3+3\right)\left(t^4+4\right)\left(t^5+5\right)+3(t+1)\left(t^2+2\right)t^2\left(t^4+4\right)\left(t^5+5\right)+4(t+1)\left(t^2+2\right)\left(t^3+3\right)t^3\left(t^5+5\right)+5(t+1)\left(t^2+2\right)\left(t^3+3\right)\left(t^4+4\right)t^4 \qquad (3.1)$$

2da manera de obtener derivada:

```
> df3:= diff(f3(t),t);
```

$$df3 := \left(t^2+2\right)\left(t^3+3\right)\left(t^4+4\right)\left(t^5+5\right)+2(t+1)t\left(t^3+3\right)\left(t^4+4\right)\left(t^5+5\right)+3(t+1)\left(t^2+2\right)t^2\left(t^4+4\right)\left(t^5+5\right)+4(t+1)\left(t^2+2\right)\left(t^3+3\right)t^3\left(t^5+5\right)+5(t+1)\left(t^2+2\right)\left(t^3+3\right)\left(t^4+4\right)t^4 \qquad (3.2)$$

Se simplifica la expresion resultante de la derivada

```
> simplify(df3);
```

$$15t^{14}+14t^{13}+26t^{12}+60t^{11}+77t^{10}+150t^9+171t^8+240t^7+259t^6+354t^5+370t^4+280t^3+300t^2+120t+120 \qquad (3.3)$$

Se evalua la derivada en el valor t=2

```
> eval(df3(t),t=2);
  evalf(%);
```

$$857592$$

$$8.57592\ 10^5 \qquad (3.4)$$

Ejercicio 1.4 $y=\frac{\sqrt{x^2+3}\left(x^3+7\right)^{1/3}}{(x+15)^{1/4}}$

1ra manera de obtener la derivada:

```
> f4:=x->((((x)^(2)+3))^(1/2))*(((x)^(3)+7))^(1/3)/((x+15))^
  (1/4));
  D((f4));
```

$$f4 := x \to \frac{\sqrt{x^2+3}\left(x^3+7\right)^{1/3}}{(x+15)^{1/4}}$$

$$x \to \frac{\left(x^3+7\right)^{1/3}x}{\sqrt{x^2+3}\,(x+15)^{1/4}}+\frac{\sqrt{x^2+3}\,x^2}{\left(x^3+7\right)^{2/3}(x+15)^{1/4}}-\frac{1}{4}\frac{\sqrt{x^2+3}\left(x^3+7\right)^{1/3}}{(x+15)^{5/4}} \qquad (4.1)$$

2da manera de obtener derivada:

```
> df4:= diff(f4(x),x);
```

$$df4 := \frac{(x^3+7)^{1/3}\,x}{\sqrt{x^2+3}\,(x+15)^{1/4}} + \frac{\sqrt{x^2+3}\,x^2}{(x^3+7)^{2/3}\,(x+15)^{1/4}} - \frac{1}{4}\,\frac{\sqrt{x^2+3}\,(x^3+7)^{1/3}}{(x+15)^{5/4}} \tag{4.2}$$

Se simplifica la expresion resultante de la derivada

```
> simplify(df4);
```

$$\frac{1}{4}\,\frac{7x^5+120x^4+9x^3+201x^2+420x-21}{\sqrt{x^2+3}\,(x+15)^{5/4}\,(x^3+7)^{2/3}} \tag{4.3}$$

Se evalua en la derivada el valor x=1

```
> eval(df4,x=1);
  evalf(%);
```

$$\frac{23}{1024}\sqrt{4}\,8^{1/3}\,16^{3/4}$$

$$0.7187500000 \tag{4.4}$$

Ejercicio 1.5 $y = \frac{x\cos(x\sin(x))}{x+\cos(x\cos(x))}$

1ra manera de obtener la derivada:

```
> f5:=x->((x*cos(x*sin(x)))/(x+cos(x*cos(x))));
  D((f5));
```

$$f5 := x \rightarrow \frac{x\cos(x\sin(x))}{x+\cos(x\cos(x))}$$

$$x \rightarrow \frac{\cos(x\sin(x))}{x+\cos(x\cos(x))} - \frac{x\,(\sin(x)+x\cos(x))\,\sin(x\sin(x))}{x+\cos(x\cos(x))} - \frac{x\cos(x\sin(x))\,(1-(\cos(x)-x\sin(x))\,\sin(x\cos(x)))}{(x+\cos(x\cos(x)))^2} \tag{5.1}$$

2da manera de obtener la derivada:

```
> df5:= diff(f5(x),x);
```

$$df5 := \frac{\cos(x\sin(x))}{x+\cos(x\cos(x))} - \frac{x\,(\sin(x)+x\cos(x))\,\sin(x\sin(x))}{x+\cos(x\cos(x))} - \frac{x\cos(x\sin(x))\,(1-(\cos(x)-x\sin(x))\,\sin(x\cos(x)))}{(x+\cos(x\cos(x)))^2} \tag{5.2}$$

Se simplifica la expresion resultante de la derivada

```
> simplify(df5);
```

$$\frac{1}{\cos(x\cos(x))^2+2x\cos(x\cos(x))+x^2}\big(-\cos(x\sin(x))\sin(x\cos(x))\sin(x)\,x^2 - \cos(x\cos(x))\sin(x\sin(x))\cos(x)\,x^2 - \sin(x\sin(x))\cos(x)\,x^3 + \cos(x\sin(x))\sin(x\cos(x))\cos(x)\,x - \cos(x\cos(x))\sin(x\sin(x))\sin(x)\,x - \sin(x\sin(x))\sin(x)\,x^2 + \cos(x\sin(x))\cos(x\cos(x))\big) \tag{5.3}$$

Se evalua en la derivada el valor x=0

```
> eval(df5,x=0);
  evalf(%)
```

$$1$$

$$1. \tag{5.4}$$

Ejercicio 1.6 $y=\sqrt{2x^2+3}\,\sin(x^2)-\dfrac{(2x^2+3)^{3/2}\cos(x^2)}{x}$

1ra Manera obtener derivada

```
> f6:=x->(((2*(x)^(2)+3)^(1/2)*sin((x)^(2)))-(((2*(x)^(2)+3))^
  (3/2)*(cos((x)^(2)))/(x)));
  D((f6));
```

$$f6 := x \rightarrow \sqrt{2x^2+3}\,\sin(x^2)-\frac{(2x^2+3)^{3/2}\cos(x^2)}{x}$$

$$x \rightarrow \frac{2\sin(x^2)\,x}{\sqrt{2x^2+3}}+2\sqrt{2x^2+3}\,x\cos(x^2)-6\sqrt{2x^2+3}\,\cos(x^2)+2\,(2x^2+3)^{3/2}\sin(x^2)+\frac{(2x^2+3)^{3/2}\cos(x^2)}{x^2} \tag{6.1}$$

2da Manera de obtener derivada

```
> df6:= diff(f6(x),x);
```

$$df6 := \frac{2\sin(x^2)\,x}{\sqrt{2x^2+3}}+2\sqrt{2x^2+3}\,x\cos(x^2)-6\sqrt{2x^2+3}\,\cos(x^2)+2\,(2x^2+3)^{3/2}\sin(x^2)+\frac{(2x^2+3)^{3/2}\cos(x^2)}{x^2} \tag{6.2}$$

Se simplifica la expresion resultante de la derivada

```
> simplify(df6);
```

$$\frac{1}{\sqrt{2x^2+3}\,x^2}\Big(8\sin(x^2)\,x^6+4\cos(x^2)\,x^5+24\sin(x^2)\,x^4-8\cos(x^2)\,x^4+2\sin(x^2)\,x^3+6x^3\cos(x^2)+18\sin(x^2)\,x^2-6\cos(x^2)\,x^2+9\cos(x^2)\Big) \tag{6.3}$$

Se evalua en la derivada el valor x=π

```
> eval(df6,x=sqrt(Pi)); #Evaluamos en la derivada el valor x=sqrt
  (Pi)
  evalf(%);
```

$$-2\sqrt{2\pi+3}\,\sqrt{\pi}+6\sqrt{2\pi+3}-\frac{(2\pi+3)^{3/2}}{\pi}$$

$$-1.522920477 \tag{6.4}$$