Last week of the year

Domain of a function of many variables:

Same rules, applied to all the variables. If we have two, we can draw the domain

$$f(x, y) = x^2 y$$

$$f(x, y) = \ln(xy)$$

$$f(x, y) = \frac{x}{x - y}$$

$$f(x, y) = \ln(y - x^2)$$

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$$f(x,y) = x^2 y \rightarrow \ (x,y) \in R^2$$

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$$f(x,y) = \ln(xy) \rightarrow xy > 0 \begin{cases} x > 0, y > 0 \\ x < 0, y < 0 \end{cases}$$

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$$f(x, y) = \ln(y - x^2) \rightarrow (x, y \in R \mid y > x^2)$$

The Schwarz theorem: The hessian matrix is symmetric

$$\frac{\partial^2 f(x,y)}{\partial x \partial y} = \frac{\partial^2 f(x,y)}{\partial y \partial x}$$

Given a real function $f(x)$,we say that $F(x)$ is the primitive function of $f(x)$, if:

$$F'(x) = f(x)$$

If $F(x)$ is a primitive, then $F(x) + C$ will be also a primitive

$$\int f(x)dx = F(x) + C \leftrightarrow F'(x) = f(x)$$

Properties:

$$\int [f(x) + g(x)]dx = \int f(x)dx + \int g(x)dx$$

$$\int k\ f(x)dx = k \int f(x)dx$$

$$\int dx = x + C$$

$$\int x^{\alpha} dx = \frac{x^{\alpha+1}}{\alpha+1} + C, \alpha \neq -1$$

$$\int [f(x)]^{\alpha} f'(x)\, dx = \frac{[f(x)]^{\alpha+1}}{\alpha+1} + C, \alpha \neq -1$$

$$\int \frac{dx}{x} = \ln|x| + C$$

$$\int \frac{f'(x)}{f(x)} dx = \ln|f(x)| + C$$

$$\int \frac{dx}{2\sqrt{x}} = \sqrt{x} + C$$

$$\int \frac{f'(x)}{2\sqrt{f(x)}} dx = \sqrt{f(x)} + C$$

$$\int e^{x} dx = e^{x} + C$$

$$\int e^{f(x)} f'(x)\ dx = e^{f(x)} + C$$

$$\int 5\,dx =$$

$$\int x^2\,dx =$$

$$\int \frac{1}{x}\,dx =$$

$$\int \frac{1}{\sqrt{x}}\,dx =$$

$$\int e^{3x}\,dx =$$

$$\int 5\,dx = 5x + C$$

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$$\int x^2\, dx = \frac{x^3}{3} + C$$

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$$\int e^{3x}\, dx = \frac{1}{3} e^{3x} + C$$

$$\int (3x-2)^2\, 3\, dx =$$

$$\int \frac{1}{2x-3}\, dx =$$

$$\int \frac{1}{\sqrt{3x+2}}\, dx =$$

$$\int e^{(3x^2-1)} 6x\, dx =$$

$$\int (3x-2)^2\, 3\, dx = \frac{(3x-2)^3}{3} + C$$

$$\int \frac{1}{2x-3}\, dx =$$

$$\int \frac{1}{\sqrt{3x+2}}\, dx =$$

$$\int e^{\left(3x^2-1\right)} 3x\, dx =$$

$$\int (3x-2)^2\, 3\, dx = \frac{(3x-2)^3}{3} + C$$

$$\frac{1}{2}\int \frac{1}{2x-3}\, 2\, dx = \frac{1}{2}\ln(2x-3) + C$$

$$\frac{1}{3}\int \frac{1}{\sqrt{3x+2}}\, 3\, dx =$$

$$\int e^{(3x^2-1)}\, 3x\, dx =$$

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$$\int e^{(3x^2-1)}\,3x\,dx = \frac{1}{2}\,e^{(3x^2-1)} + C$$