المادة: الرياضيات

المرحلة: الاولى

المحاضر: م.م رياض حامد

2021-2022

Lecture (4)

==

Graph of Functions (Graph of Curves) رسم الدوال

To graph the curve of a function, we can follow the following steps:

1. Find the domain and range of the function.
2. Check the symmetry of the function
3. Find (if any found) points of intersection with *x*-axis and *y*-axis.
4. Choose some another points on the curve.
5. Draw s smooth line through the above points.

Example 3: Sketch the graph of the curve $y = f(x) = x^2 - 1$

Sol.:

Step 1: Find Df, Rf of the function?

Df = $(-\infty,\infty)$;

To find Rf : we must convert the function from y= f(x) into x=f(y).

$$y = x^2 - 1$$

$y = x^2 - 1 \quad \rightarrow \quad x^2 = y + 1$

$$x = \pm\sqrt{y+1}$$

So $y + 1 \geq 0 \Rightarrow y \geq -1 \Rightarrow$ Rf $= (-1,\infty)$

Step 2: Find x and y intercept:

To find x-intercept put y=0 $\rightarrow$ $x^2 - 1 = 0 \rightarrow X = \pm 1$

So x-intercept are (-1,0) and (+1,0).

To find y-intercept put x=0 $\rightarrow$ y = 0-1 $\rightarrow$ y = -1

So y-intercept is (0,-1).

Step 3: check the symmetry:

$x^2 - y - 1 = 0$

$f(x,-y) = x^2 + y - 1 \neq f(x,y)$

==

$\mathbf{f(-x,y) = x^2 - y - 1 = f(x,y)}$ **so that the function is symmetry about y.**

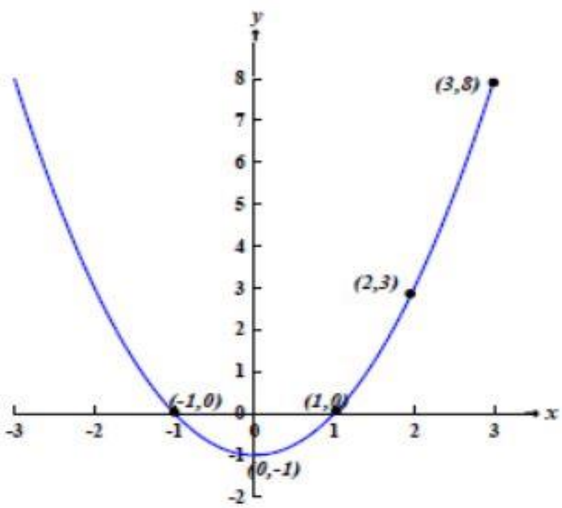
$\mathbf{f(-x,-y) = x^2 + y - 1 \neq f(x,y)}$

Step 4: Choose some another point on the curve.

x	y
2	3
3	8

(2,3) ,(3,8)

Step 5: Draw smooth line through the above points



H.W

1- $\boldsymbol{y = 3x^2 - 2}$

2- $\boldsymbol{y^2 = 4x - 1}$

==

===

DERIVATIVES المشتقة

the definition of derivative of the function f(x) and this denoted by y' or $\frac{dy}{dx}$ or $\frac{d}{dx}f(x)$ or $D_x f(x)$ or $f'(x)$ and given by the formula

$$f'(x) = \lim_{\Delta x \to 0} \frac{f(x+\Delta x) - f(x)}{\Delta x}$$

Example1: Find the derivative of the function $\boldsymbol{f(x) = x^2}$ using the definition of derivative.

Sol: $\boldsymbol{f(x) = x^2}$

$$\boldsymbol{f(x+\Delta x) = (x+\Delta x)^2}$$

$$f'(x) = \lim_{\Delta x \to 0} \frac{f(x+\Delta x) - f(x)}{\Delta x}$$

$$f'(x) = \lim_{\Delta x \to 0} \frac{(\boldsymbol{x} + \Delta \boldsymbol{x})^2 - \boldsymbol{x}^2}{\Delta x}$$

$$f'(x) = \lim_{\Delta x \to 0} \frac{(\boldsymbol{x}^2 + \boldsymbol{2x}\Delta x + \Delta x^2) - \boldsymbol{x}^2}{\Delta x}$$

$$f'(x) = \lim_{\Delta x \to 0} \frac{(\boldsymbol{2x}\Delta x + \Delta x^2)}{\Delta x}$$

$$f'(x) = \lim_{\Delta x \to 0} \frac{\Delta x(\boldsymbol{2x} + \Delta x)}{\Delta x}$$

$$f'(x) = \lim_{\Delta x \to 0} (\boldsymbol{2x} + \Delta x) = 2x + 0 = 2x$$

==

المادة: الرياضيات

المرحلة: الاولى

المحاضر: م.م رياض حامد

2021-2022

Lecture (4)

==

Example2: Find the derivative of the function $\boldsymbol{f(x) = 3x}$ using the definition of derivative.

Sol: $\boldsymbol{f(x) = 3x}$

$\boldsymbol{f(x+\Delta x) = 3(x+\Delta x)}$

$$f'(x) = \lim_{\Delta x \to 0} \frac{f(x+\Delta x) - f(x)}{\Delta x}$$

$$f'(x) = \lim_{\Delta x \to 0} \frac{\boldsymbol{3(x+\Delta x) - 3x}}{\Delta x}$$

$$f'(x) = \lim_{\Delta x \to 0} \frac{\boldsymbol{3x + 3\Delta x - 3x}}{\Delta x}$$

$$f'(x) = \lim_{\Delta x \to 0} \frac{\boldsymbol{3\Delta x}}{\Delta x} = 3$$

====================================