المادة :الرياضيات
المرحلة :الاولى
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Lecture (5)

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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 = (-∞,∞);

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 ≥ 0 ⇒ y ≥ -1 ⇒ Rf = (-1,∞)

Step 2: Find x and y intercept:

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

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

To find y-intercept put x=0 → y = 0-1 → y = -1

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

Step 3: check the symmetry:

$$x^2 - y - 1 = 0$$

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

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

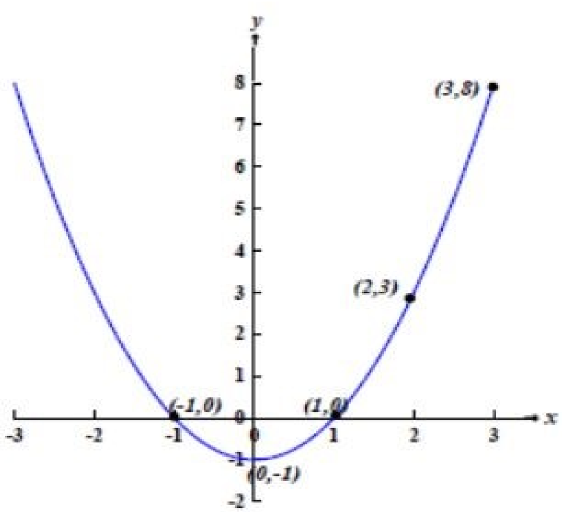
$f(-x,-y) = \ ^{2} + y - 1 \neq f(x,y)$

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- $y = 3x^2 - 2$

2- $y^2 = 4x - 1$

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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