

Subject:

موضوع: حساب التفاضل والتكامل

$$t = \sqrt{x - \varepsilon} \quad x + \varepsilon \sqrt{x - \varepsilon} = t^2 + \varepsilon + \varepsilon t = (t + \varepsilon)^2$$

$$x = t^2 + \varepsilon \quad f(x) = \sqrt{(t + \varepsilon)^2} = t + \varepsilon$$

في حين أن $x = t^2 + \varepsilon$ فإن $t = \sqrt{x - \varepsilon}$

$$g(x) \rightarrow x - \varepsilon \sqrt{x - \varepsilon} = t^2 - \varepsilon - \varepsilon t = (t - \varepsilon)^2$$

$$g(x) = t - \varepsilon$$

$$f(x) + g(x) = (t + \varepsilon) + (t - \varepsilon) = 2t$$

$$f(x) + g(x) = 2\sqrt{x - \varepsilon} \quad \text{عند } t = \sqrt{x - \varepsilon}$$

$$a = 0 \quad b = \varepsilon \quad c = -\varepsilon$$

$$\frac{a+b}{c} = \frac{0 + \varepsilon}{-\varepsilon} = -1$$

$$D_g = \{0, 1, 2, 3\}$$

$$f(x) \rightarrow x^2 - \varepsilon x + \varepsilon = (x - 1)(x - \varepsilon)$$

$$\text{بما أن } x \neq 1 \quad x \neq \varepsilon$$

$$x = 0 \rightarrow g(0) = \varepsilon \quad f(0) = \frac{\varepsilon}{0}$$

$$\frac{g(0)}{f(0)} = \frac{\varepsilon}{\frac{\varepsilon}{0}} = 0$$

(0, 4) عند $x = 0$

$$x = 1 \rightarrow g(1) = 1 \quad f(1) = \frac{\varepsilon}{-1} = -\varepsilon$$

$$\frac{g(1)}{f(1)} = \frac{1}{-\varepsilon} = -\frac{1}{\varepsilon}$$

$$\frac{g}{f} = \left\{ (0, 4), (1, -\frac{1}{\varepsilon}) \right\}$$

$$الف) f(x) \quad x \rightarrow \frac{1}{x}, \frac{x}{x}, x, -\frac{1}{x}$$

$$f(x) = \left\{ \left(\frac{1}{x}, x \right), \left(\frac{x}{x}, -1 \right), (x, x), \left(-\frac{1}{x}, x \right) \right\}$$

$$ب) f(x^2) \quad x \rightarrow \pm 1, \pm \sqrt{x}, \pm x$$

$$f(x^2) = \left\{ (-x, x), (x, x), (1, x), (-1, x), (\sqrt{x}, -1), (-\sqrt{x}, -1) \right\}$$

$$ج) xg^2(x) + 1 \Rightarrow \{(-x, 9), (1, 3), (3, 9), (-1, 1)\}$$

$$x = -x \rightarrow x(3)^2 + 1 = 9$$

$$x = 1 \rightarrow x(-1)^2 + 1 = 3$$

$$x = 3 \rightarrow x(x)^2 + 1 = 9$$

$$x = -1 \rightarrow x(0)^2 + 1 = 1$$

$$د) \frac{xf}{g}$$

$$xf = \{ (x, -x), (x, x), (-1, x), (1, x) \}$$

$$\frac{xf}{g} = \{ (-1, \frac{x}{x}), (1, -\frac{x}{x}), (3, -1) \} \rightarrow \frac{xf}{g} = \{ (3, -1), (1, -x) \}$$

$$h = xf + g$$

$$x = x \rightarrow h(x) = x(1) + x = 2$$

$$h = \{ (x, 2), (3, 2), (-x, 2) \}$$

$$x = 3 \rightarrow h(3) = x(1) + x = 2$$

$$x = -x \rightarrow h(-x) = x(0) + x = x$$

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رابطه اولی
 $x^3 - 1 = 0$
 $x^3 = 1$

رابطه دومی
 $\sqrt{x^2 - x} = 0$

$\sqrt{x^2 - x}$

$x^2 - x$

$x(x-1) = 0$

$\frac{0}{0} = \frac{0}{0}$
 $\frac{0}{0} = \frac{0}{0}$
 $\frac{0}{0} = \frac{0}{0}$

مخرج $x-1 \neq 0$
 $x \neq 1$

$g(x) = [x] + [-x]$

$x \in \mathbb{Z}$
 $g(x) = 0$

$g(x) + 1 = 1$

$g(x) = -1 \leftarrow x \notin \mathbb{Z}$

مخرج $g(x) + 1$

$D = \{0, 1, 2\}$

$x^2 - x - 1 = 0 \rightarrow (x-1)(x-2) = 0$
 $x^2 + 2x + 1 = 0$
 $1 \leq x \leq 2$

$R_g = \{1, 2, 3, 4\}$

$x=1 \rightarrow h(1) = \frac{\sqrt{4-1-1}}{2} = 0$

مخرج $\rightarrow \{1, 2, 3\}$

$x=2 \rightarrow h(2) = \frac{\sqrt{10-4-1}}{2} = \frac{\sqrt{5}}{2}$

$x=3 \rightarrow h(3) = \frac{\sqrt{10-9-1}}{2} = 0$

$u = \{(1, 0), (2, \frac{\sqrt{5}}{2}), (3, 0)\}$

الف) $y = x^3 - 3x^2 + 3x \rightarrow y = (x-1)^3 + 1$ $R_y = \mathbb{R}$

ب) $y = \frac{1}{x^2 - x} \rightarrow x^2 - x = (x-1)^2 - 1 \rightarrow y = \frac{1}{(x-1)^2 - 1}$

مثلاً $y(x^2 - x) = 1$

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

$\Delta > 0 \rightarrow (-xy)^2 - 4(y)(-1) > 0$

$xy^2 + 4y > 0 \rightarrow y(y+4) > 0$

$R_y = (-\infty, -1] \cup (0, +\infty)$

$y < -1$
 $y > 0$

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$$الف) y = x^2 - 4x + 10$$

ا) > 0

$$\begin{cases} x = \frac{-b}{2a} = \frac{4}{2} = 2 \\ y = 2^2 - 4 \cdot 2 + 10 = 2 \end{cases}$$

$$R_y = [2, +\infty)$$

$$ب) y = -x^2 + 4x + 10$$

ا) < 0

$$R_y = (-\infty, 14]$$

$$\begin{cases} x = \frac{-b}{2a} = \frac{-4}{-2} = 2 \\ y = -2^2 + 4 \cdot 2 + 10 = 14 \end{cases}$$

$$ج) y = \sqrt{x^2 - 4x - 10}$$

ا) > 0

$$R = \sqrt{[-1, +\infty)} = [0, +\infty)$$

$$\begin{cases} x = \frac{-b}{2a} = \frac{4}{2} = 2 \\ y = 2^2 - 4 \cdot 2 - 10 = -14 \end{cases}$$

$$د) y = \sqrt{4x - x^2}$$

ا) < 0

$$R = \sqrt{(-\infty, 4]} = [0, 2]$$

$$\begin{cases} x = \frac{-b}{2a} = \frac{2}{-1} = -2 \\ y = 1 - 4 = -3 \end{cases}$$

$$و) y = x^4 - 4x^2 + 4x + 1 \quad R_y = \mathbb{R}$$

$$ز) y = x^4 - 4x^2 + 4x + 1 \quad R_y = \mathbb{R}$$

$$ح) y = \sqrt{x^4 - 4x^2 + 4x + 1} \quad R_y = \sqrt{\mathbb{R}} = [0, +\infty)$$

$$ط) y = (x^4 - 4x^2 + 4x + 1) \rightarrow R_y = [0, +\infty)$$

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ii) $y = \frac{wx+1}{x-4}$ $\xrightarrow{\text{مساوي 0}}$ $R_y = \mathbb{R} - \left\{\frac{a}{c}\right\} \rightarrow R_y = \mathbb{R} - \{w\}$

$$y = \frac{ax+b}{cx+d} \quad ad \neq bc$$

iii) $y = \frac{4x+1}{x+1}$ $\xrightarrow{\text{مساوي 0}}$ $R_y = \mathbb{R} - \left\{\frac{a}{c}\right\} \rightarrow R_y = \mathbb{R} - \{1\}$