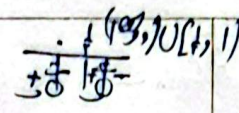
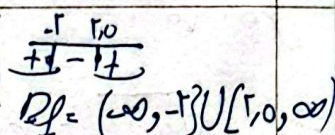


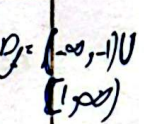
الف) $f(x) = \sqrt{\frac{x-1}{x}} - \frac{x}{x-1} = \sqrt{\frac{x^2-2x+1-x^2}{x^2-x}} = \sqrt{\frac{-2x+1}{x(x-1)}}$ 
 $D_f = (-\infty, 0) \cup [1, 1]$

ب) $f(x) = \frac{\frac{1}{x+1} - \frac{1}{x}}{\frac{1}{x+1} + \frac{1}{x}}$ 
 $D_f = \mathbb{R} - \{-1, 0, 1\}$

ج) $f(x) = \sqrt{(\frac{1}{x}-9)(\frac{1}{x}-\frac{1}{4})}$ 
 $D_f = (-\infty, -2] \cup [2, 0)$

$D_f = (1, 12]$

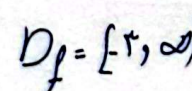
$x_{max} = 12 \Rightarrow \sqrt{y+1} = 0 \Rightarrow \sqrt{x-1} = 2 \Rightarrow x=5$
 کمترین مقدار x مقدار 12 است
 چون x از مقدار مشخصی افزایش می یابد مقدار x محدود نمی باشد

د) $f(x) = \frac{\log(x^2-x-2)}{\sqrt{x^2-1}+1}$ 
 $D_f = (-\infty, -1) \cup [1, \infty)$
 سیمیه را یکجا محاسبه نموده و معادله را حل می شود

$f(x) = \sqrt{-x^2+ax+4}$ و $D_f = [-2, b]$

$-2 \xrightarrow{f} -(-2)^2 + a(-2) + 4 = 0 \Rightarrow -2a = 0 \Rightarrow a = 0 \Rightarrow f(x) = \sqrt{-x^2 + 4}$
 $p = \frac{c}{a} \cdot -2 = \frac{-2 \cdot b}{-2} \Rightarrow b = 2$ $a+b = \frac{4}{-2} - \frac{1}{-2} = 1$

چون -2 ریشه است و دامنه است پس می تواند اینطور استعلام کرد که -2 ریشه است زیرا یکجا محاسبه می شود

ه) $f(x) = \sqrt{f(x) \cdot x}$ 
 $D_f = [-2, \infty)$

$$f(x) = 2x^2 - 5x$$

$$f\left(\sin \frac{\pi}{4} + \cos \frac{\pi}{4}\right) = f\left(\frac{\sqrt{2}}{2} + 1\right) = f\left(\frac{\sqrt{2}+2}{2}\right) = 2\left(\frac{\sqrt{2}+2}{2}\right)^2 - 5\left(\frac{\sqrt{2}+2}{2}\right) = \frac{2+4\sqrt{2}}{2} - \frac{5\sqrt{2}+10}{2} = \frac{2+4\sqrt{2}-5\sqrt{2}-10}{2} = \frac{-8-\sqrt{2}}{2}$$

$$f(x) = 2x^2 - 5x \quad g(x) = \sqrt{x+1} \quad f(g(0)) = -5$$

$$f(g(x)) = \left(\sqrt{x+1}\right)^2 - 5\sqrt{x+1} = -5 \quad \xrightarrow{\sqrt{x+1}=t} \quad t^2 - 5t + 5 = 0 \quad t^2 - 5t + 5 = 0 \Rightarrow (t-2)^2 = 0 \Rightarrow t=2 \Rightarrow x+1=4 \Rightarrow x=3$$

$$f(x) = \frac{x+1}{x-1} \quad f(f(a)) = a$$

$$f(a) = \frac{a+1}{a-1} \Rightarrow a = f(f(a)) = \frac{\frac{a+1}{a-1} + 1}{\frac{a+1}{a-1} - 1} = \frac{\frac{a+1+a-1}{a-1}}{\frac{a+1-a+1}{a-1}} = \frac{2a}{2} = a \Rightarrow a=a$$

به ازای هر مقدار a صحیح است

$$f(x+y) = x^2 - 0x + y^2$$

$$x+y \neq 0 \quad \left. \begin{array}{l} x=1 \Rightarrow f(1+y) = (1)^2 - 0(1) + y^2 = 1+y^2 \\ x=-1 \Rightarrow f(-1+y) = (-1)^2 - 0(-1) + y^2 = 1+y^2 \end{array} \right\} \Rightarrow f(-1) \times f(1) = 1 \times 1 = 1$$

$$f(\cos x) = \tan x \quad \left. \begin{array}{l} \cos x = \frac{1}{2} \Rightarrow \cos^2 x = \frac{1}{4} \\ \sin^2 x + \cos^2 x = 1 \Rightarrow \sin^2 x + \frac{1}{4} = 1 \Rightarrow \sin^2 x = \frac{3}{4} \Rightarrow \sin x = \frac{\sqrt{3}}{2} \end{array} \right\} \Rightarrow \tan x = \frac{\sin x}{\cos x} = \frac{\frac{\sqrt{3}}{2}}{\frac{1}{2}} = \sqrt{3}$$