

الف) $\frac{(x-1)^2 - x^2}{x(x-1)} \geq 0$ $\frac{x^2 - 2x + 1 - x^2}{x(x-1)} \geq 0$ $\frac{1-2x}{x(x-1)} \geq 0$ $D_f = (-\infty, 0) \cup [\frac{1}{2}, 1)$ $\rightarrow f(x) = \frac{-(x+2)^2(x-1)}{x(x+1)(x+2)} \rightarrow x+2 \neq 0 \rightarrow x \neq -\frac{2}{x}$ $D_f = (-\frac{2}{x}, -1) \cup (0, 1)$	1
الف) $[(\frac{1}{t})^2 - 9](32 - t^2) \geq 0$ $t = t^2 \rightarrow t > 0$ $\frac{1}{t} - 9 = \frac{1-9t}{t} \rightarrow 32 - t^2$ $1-9t = 0 \rightarrow t = \frac{1}{9}$ $32 - t^2 = 0 \rightarrow t = \pm\sqrt{32}$ $0 < \frac{1}{9}$ $t \geq \sqrt{32}$ $D_f = (-\infty, -\sqrt{32}] \cup [\frac{1}{9}, +\infty)$ $\rightarrow 3 - \sqrt{x-1} \geq 0$ $\sqrt{x-1} \leq 3$ $x-1 \leq 9$ $x \leq 10$ $D = [-\infty, 10]$	2
$x^2 - x - 2 > 0$ $(x-2)(x+1) > 0$ $x^2 - 1 \geq 0$ $x \leq -1$ $x \geq 1$ $x < -1$ $x > 2$ $D = (-\infty, -1) \cup (2, \infty)$	3
$3 + ax - x^2 \geq 0$ $[-2, b]$ $(-2)b = \frac{c}{A} = \frac{3}{-1} = -3$ $b = \frac{3}{1}$ $-2 + b = a$ $a = -2 + \frac{3}{1} = -\frac{1}{1}$ $a + b = -\frac{1}{1} + \frac{3}{1} = 2$ جواب 2	4
$f(x) = 3x - 2$ $3x - 2 - x \geq 0$ $2x - 2 \geq 0 \rightarrow x \geq 1$ $f(x) = 2x + 3$ $2x + 3 - x \geq 0$ $x + 3 \geq 0 \rightarrow x \geq -3$ $[-3, 1) \cup [1, \infty) = [-3, \infty)$ جواب	5

$f(x) = 2x^2 - 5x \quad \sin \frac{\pi}{4} + \cos 2\pi = \frac{\sqrt{2}}{2} + 1$ $f\left(\frac{\sqrt{2}}{2} + 1\right) = 2\left(1 + \frac{\sqrt{2}}{2}\right)^2 - f\left(1 + \frac{\sqrt{2}}{2}\right) = -\frac{1}{2}$ جواب	٦
$f(x) = \frac{x+1}{x-1} \quad f(f(a)) = \frac{\frac{a+1}{a-1} + 1}{\frac{a+1}{a-1} - 1}$ $\frac{a+1+a-1}{a-1} = \frac{2a}{a-1} \quad \frac{a+1-a+1}{a-1} = \frac{2}{a-1}$ $f(f(a)) = \frac{\frac{2a}{a-1}}{\frac{2}{a-1}} = a \quad a \neq 1 \quad a \in \mathbb{R} - \{1\}$ جواب	٧
$f(x) = x^2 - 5x \quad g(x) = \sqrt{x^2 - 1} \quad f(g(a)) = -4$ $(\sqrt{a^2 - 1})^2 - 5\sqrt{a^2 - 1} = -4 \quad a^2 - 1 - 5\sqrt{a^2 - 1} = -4 \quad t = \sqrt{a^2 - 1}$ $t^2 - 5t = -4 \quad t^2 - 5t + 4 = 0 \quad (t-2)(t-1) = 0 \quad t = 2$ $\sqrt{a^2 - 1} = 2 \quad a^2 - 1 = 4 \quad a^2 = 5 \quad a = \pm\sqrt{5}$ جواب	٨
$f(x+2) = x^2 - 5x + 4 \quad x+2=0 \rightarrow x=-2 \quad f(2) = 1^2 - 5(1) + 4 = 0$ $x+2 = -2 \Rightarrow x = -4 \quad f(-2) = (-4)^2 - 5(-4) + 4 = 16 + 20 + 4 = 40$ $f(2) \times f(-2) = 0 \times 40 = 0$ جواب	٩
$4\cos^2 x + 5\cos x = 3, 0 \quad \cos x = t \quad 4t^2 + 5t = 3, 0 \quad 4t^2 + 5t - 3 = 0$ $(4t-3)(t+1) = 0 \quad t = \frac{3}{4} \quad t = -1$ $\tan^2 x = \frac{1 - \cos^2 x}{\cos^2 x} = \frac{1 - \frac{9}{16}}{\frac{9}{16}} = \frac{7}{9}$ $f(3, 0) = 3$ جواب	١٠