

① $f(x) = 2 \sin\left(x + \frac{\pi}{2}\right) - 1$ $\xrightarrow{\sin x = 0} f(x) = -1$ $R_f = [-1, 1]$
 $\xrightarrow{\sin x = 1} f(x) = 1$

$g(x) = 1^x \cos x - 2$ $\xrightarrow{\cos x = -1} f(x) = -1$ $R_f = [-1, -1]$
 $\xrightarrow{\cos x = 1} f(x) = -1$

② $y = \frac{x}{|x|} + [x]$ $\Rightarrow$

$-3 \leq x < -2 \rightarrow -1 - 3 = -4$	
$-2 \leq x < -1 \rightarrow -1 - 2 = -3$	
$-1 \leq x < 0 \rightarrow -1 - 1 = -2$	
$0 \leq x < 1 \rightarrow 1 + 0 = 1$	
$1 \leq x < 2 \rightarrow 1 + 1 = 2$	
$2 \leq x < 3 \rightarrow 1 + 2 = 3$	
$x = 3 \rightarrow 2$	

③ $y = \left| \frac{x+1}{x+3} \right| \rightarrow$ $\frac{1}{x+3}$ $y = \left| \frac{x+1}{x+3} \right|$

④ $x > 2, y > 1 \rightarrow x - 2 + y - 1 = 1 \rightarrow y = -x + 4$
 $x > 2, y < 1 \rightarrow x - 2 - y + 1 = 1 \rightarrow y = x - 2$
 $x < 2, y > 1 \rightarrow -x + 2 + y - 1 = 1 \rightarrow y = x + 2$
 $x < 2, y < 1 \rightarrow -x + 2 - y + 1 = 1 \rightarrow y = -x$
 $y = |x - 2| + |y - 1|$

⑤ $y = x + \frac{1}{x} + 2\sqrt{x + \frac{1}{x}}$ $x + \frac{1}{x} \rightarrow R_f = (-\infty, -2] \cup [2, +\infty)$
 $\min_i = 2 + \sqrt{2} \rightarrow R_f = [2 + \sqrt{2}, +\infty)$

دانشگاه دلیل وجود این فصل تنها $[2, +\infty)$ قابل قبول است.

$y = (\pi - \sin x)(1 + \sin x) = -\sin^2 x + 2\sin x + \pi$ $R_f = [0, \pi]$
 $\sin x = 1 \rightarrow \pi$ $-\frac{b}{2a} = 1 \rightarrow \sin x = 1 \rightarrow \pi$
 $\sin x = -1 \rightarrow 0$

$$D_f \in \mathbb{N} \rightarrow D_f = \{1, 2, \dots, 9\}$$

$$x=1 \rightarrow -\frac{1}{1} + 1.$$

$$x=4 \rightarrow -\frac{4}{4} + 1.$$

$$x=2 \rightarrow -\frac{2}{2} + 1.$$

$$x=5 \rightarrow -\frac{5}{5} + 1.$$

$$x=3 \rightarrow -\frac{3}{3} + 1.$$

$$x=8 \rightarrow -\frac{8}{8} + 1.$$

$$x=6 \rightarrow -\frac{6}{6} + 1.$$

$$x=9 \rightarrow -\frac{9}{9} + 1.$$

$$x=7 \rightarrow -\frac{7}{7} + 1.$$

$$\text{مجموعه } \sum_{k=1}^n \left(-\frac{k}{k} + 1\right) = -\frac{\sum k}{n} + 9 = -\frac{10}{2} + 9 = \frac{\sqrt{10}}{2} \quad (6)$$

$$\downarrow$$

$$\left(-\frac{1}{1} + 1\right) + \left(-\frac{2}{2} + 1\right) + \dots + \left(-\frac{9}{9} + 1\right) = \sqrt{10}$$

$$f(x) = \sqrt{ax^2 + bx + c} \Rightarrow f(x) = \sqrt{x-2} \rightarrow b=1, c=-2$$

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

$$\hookrightarrow a=0 \quad \sqrt{2x-4} = f(x) = 1 \quad \text{or}$$

$$g(x) = \sqrt{x^2 + 2} \rightarrow R_g = [2, +\infty)$$

$$f(x) = \frac{x(x^2-2)}{x+2} = \frac{x(x-2)(x+2)}{x+2} = x^2 - 2x \quad \min = -\frac{\Delta}{2a} = -1 \rightarrow R_f = [-1, +\infty) - \{2\} \quad (8)$$

$$D_f = \mathbb{R} - \{-2, 2\}$$

$$f\left(\frac{a+b}{2}\right) = f(-1) \rightarrow f(-1) = 2$$

$$1 \neq x(x-2) \rightarrow b \rightarrow 2$$

$$2 \neq x(x-2) \rightarrow a \rightarrow -2$$

$$y = \sqrt[3]{x^3 + ax^2 + bx - 1} \rightarrow \sqrt[3]{(x-2)^3} \rightarrow \sqrt[3]{x^3 - 4x^2 + 11x - 8} \rightarrow a = -4, b = 12 \quad (9)$$

این تابع را می توان به صورت زیر نوشت:

$$\boxed{y = x - 2} \rightarrow \text{خط مستقیم}$$

$$D_f = [-4, 12] \rightarrow R_f = [-1, 1]$$

$$x = -4 \rightarrow y = -4 - 2 = -6$$

$$x = 12 \rightarrow y = 12 - 2 = 10$$

$$y = [x] + \left[x + \frac{1}{x}\right] \quad D_f = \left[\frac{1}{2}, 2\right] \rightarrow \frac{1}{2} \leq x < 1 \rightarrow y = 1$$

$$1 \leq x < \frac{3}{2} \rightarrow y = 2$$

$$\frac{3}{2} \leq x < 2 \rightarrow y = 3$$

