

۲. آزمون های نوبت

$$n \geq 8 \rightarrow g(n), f(n) \geq 0 \rightarrow (g(n) + f(n))^2 =$$

$$n - 4\sqrt{n-4} + n + 4\sqrt{n-4} + 2\sqrt{n^2 - 16(n-4)}$$

$$= 2n + 2\sqrt{n^2 - 16n + 64} \geq 2n + 2(n-4) = 4n - 8 \quad n-14$$

$$= 4(n-4) \rightarrow g(n) + f(n) = 2\sqrt{n-4} \rightarrow \frac{a}{b} = \frac{c}{d} \rightarrow \frac{a+b}{c} = \frac{1}{-4} \quad \left[\frac{1}{-4} \right]$$

$$f(n) = \left\{ \left(2, \frac{4}{-1} \right), \left(1, \frac{4}{0} \right), \left(0, \frac{4}{1} \right), \left(0, \frac{4}{2} \right) \right\}$$

$$g(n) = \left\{ \left(2, \frac{1}{-4} \right), \left(0, \frac{4}{2} \right) \right\} = \left\{ \left(2, -\frac{1}{4} \right), \left(0, 2 \right) \right\}$$

۱) $f(2n) =$

$$\left\{ \left(\frac{1}{2}, 2 \right), \left(\frac{4}{2}, -1 \right), \left(2, 0 \right), \left(-\frac{1}{2}, 4 \right) \right\}$$

۲) $f(n^2) =$

$$\left\{ \left(-1, 2 \right), \left(1, 2 \right), \left(-\sqrt{2}, -1 \right), \left(\sqrt{2}, -1 \right), \left(-2, 2 \right), \left(2, 2 \right) \right\}$$

۳) $2g(n) + 1 =$

$$\left\{ \left(-2, 19 \right), \left(1, 9 \right), \left(4, 9 \right), \left(-1, 1 \right) \right\}$$

۱) $\frac{4}{2} = \left\{ \left(1, \frac{4}{-1} \right), \left(0, \frac{4}{2} \right), \left(2, \frac{4}{1} \right) \right\}$

$$\rightarrow \left\{ \left(1, -4 \right), \left(0, 2 \right) \right\}$$

$$h(n) = 2f(n)g(n) = \left\{ \left(2, 4 \right), \left(0, 8 \right), \left(-2, 4 \right) \right\}$$

$$g \neq -1 \rightarrow n \in \mathbb{Z} \quad \text{①} \quad \text{②} \quad n \neq 5$$

$$\text{③} \quad cm > 0 \rightarrow n \geq 0$$

$$\text{④} \quad \sqrt{cm} \geq n \rightarrow cm \geq n^2 \rightarrow n^2 \cdot cm \leq n^2 \cdot n^2 \rightarrow n^4 \leq n^4$$

$$R_f = \{ 0, 1, 5 \}$$

$$f(n) = \sqrt{-(n^2 - 8n + 15)} = \sqrt{-(n-1)(n-5)} \rightarrow \frac{-1}{-1+5} \text{ ع$$

$$h(n) = \left\{ \left(1, \frac{0}{4}\right), \left(2, \frac{\sqrt{3}}{4}\right), \left(3, \frac{0}{4}\right) \right\} \rightarrow \left\{ (1,0), (2, \frac{\sqrt{3}}{4}), (3,0) \right\} \text{ ع}$$

$$1) y = n^2 - 2n^2 + 2n = y = (n-1)^2 + 1 \rightarrow y-1 = (n-1)^2$$

$$\sqrt{y-1} = n-1 \rightarrow n = 1 + \sqrt{y-1} \rightarrow \boxed{R_f = \mathbb{R}} \text{ ع}$$

$$\rightarrow y = \frac{1}{n^2 - 2n} \rightarrow y(n^2 - 2n) = 1 \rightarrow y(n^2 - 2n - 1) = -1 \rightarrow n = \frac{y \pm \sqrt{4y^2 + 4y}}{2y} = \frac{-1 \pm \sqrt{1+4y}}{2y} \text{ ع}$$

$$2) y = n^2 + 2n + 1 \rightarrow \text{ent} \left| \frac{y}{2} = \frac{1}{2} \right| \text{ ع}$$

$$\rightarrow y = 2 - 1 + 1 = 2 \rightarrow \boxed{R_f = [2, +\infty)} \text{ ع}$$

$$\rightarrow y = -n^2 + 2n + 1 \rightarrow \text{ent} \left| \frac{y}{2} = \frac{1}{2} \right| \text{ ع}$$

$$\rightarrow -4 + 1 + 4 = 1 \rightarrow \boxed{R_f = (-\infty, 1]} \text{ ع}$$

$$3) y = \sqrt{n^2 - 2n - 1} \rightarrow \text{ent} \left| \frac{y}{2} = \frac{1}{2} \right| \text{ ع}$$

$$\rightarrow y = 2 - 1 - 1 = 0 \rightarrow \boxed{R_f = [0, +\infty)} \text{ ع}$$

$$4) y = \sqrt{4n - n^2} \rightarrow \text{ent} \left| \frac{y}{2} = \frac{1}{2} \right| \text{ ع}$$

$$\rightarrow y = 4 - 1 = 3 \rightarrow \boxed{R_f = \sqrt{[-\infty, 3]} = [-\infty, 3]} \text{ ع}$$

$$5) y = n^2 - 8n^2 + 2n + 1 \rightarrow \boxed{R_f = \mathbb{R}} \text{ ع}$$

$$6) y = n^2 - 4n^2 + 2n + 2 \rightarrow \boxed{R_f = \mathbb{R}} \text{ ع}$$

$$7) y = \sqrt{n^2 - 4n^2 + 2n + 1} \rightarrow R_f = \sqrt{\mathbb{R}} = [-\infty, +\infty) \text{ ع}$$

$$8) y = (n^2 - 4n^2 + 2n + 1)^2 \rightarrow R_f = (\mathbb{R})^2 \rightarrow \boxed{R_f = [0, +\infty)} \text{ ع}$$

$$9) y = \frac{n+1}{n-2} \rightarrow R_f = \mathbb{R} - \left\{ \frac{2}{1} \right\} \rightarrow \boxed{R_f = \mathbb{R} - \left\{ \frac{2}{1} \right\}} \text{ ع}$$

$$10) y = \frac{n+1}{n+1} \rightarrow R_f = \mathbb{R} - \left\{ \frac{2}{1} \right\} \rightarrow \boxed{R_f = \mathbb{R} - \left\{ \frac{2}{1} \right\}} \text{ ع}$$