

$1 < n < 3$ (عددهای منفی) \rightarrow $\Rightarrow f = f = \frac{-(-a)}{1} \Rightarrow a = f$
 و برای مقادیر دیگر n منفی $p = 3 = \frac{b}{1} \Rightarrow b = 3$ ✓

$\Rightarrow n^2 - 4n + 3 = 0 \Rightarrow a + b = f + 3 = \boxed{7}$ ✓
 $n = 2 \Rightarrow f - 1 + 3 = 0$ ✓
 $n = 1 \Rightarrow 0 = 0$ ✓

$(n - 3n)^2 = 0 \xrightarrow{n=-1} -1 - 3n = 0 \Rightarrow n = -\frac{1}{3}$ ✓

$(k - 2)n + m - 1 = 0 \xrightarrow{n=f} f(k - 1) + m - 1 = 0 \Rightarrow m = 1 - f(k - 1)$

$\text{if } n = 5 \Rightarrow 5k - 1 + m < 0 \rightarrow 5k - 1 + 9 - 4k - 1 < 0 \Rightarrow k < 2, k \in \mathbb{N}$
 $\Rightarrow k = 1$ ✓ $\Rightarrow (-1) \times f + m - 1 = 0 \Rightarrow m = 5$ ✓
 $\Rightarrow \frac{m}{n} + k = \frac{5}{-1/3} + 1 = -15 + 1 = \boxed{-14}$ ✓

$y = -\frac{1}{4}n^2 + 2n + 4 \Rightarrow 0 = n^2 + 2n - 3 \Rightarrow n \rightarrow \frac{1}{-1/4} = -2$
 $n = 4 \Rightarrow y = 0$ \Rightarrow عدد به دست آمده برعکس کمتر شود
 $n = 5 \Rightarrow y = \frac{5}{4}$
 $n = -1 \Rightarrow y = -\frac{1}{4}$
 $n = 0 \Rightarrow y = 4$

$(-1, 5) \Rightarrow b - a = 5 - (-1) = \boxed{6}$ ✓
 $-\frac{1}{4}n^2 + 2n + 4 = \frac{5}{4} \Rightarrow -\frac{1}{4}n^2 + 2n + \frac{15}{4} = 0 \Rightarrow n^2 - 8n - 15 = 0$ ✓

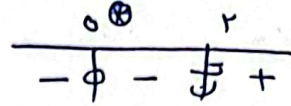
$f(n) = n^3 - 3n^2 - n + 3 \xrightarrow{\text{جمع ضرایب} = 0} n^3 - 3n^2 - n + 3 \begin{matrix} |n-1 \\ n^2 - 2n - 3 \\ \hline n^3 - 3n^2 - n + 3 \\ -2n^2 - n + 3 \\ +2n^2 + 2n \\ \hline -3n + 3 \\ -3n + 3 \\ \hline 0 \end{matrix}$

$f(n) = (n-1)(n+1)(n-3)$ $\xrightarrow{n > 0}$
 $p = -1, 1, 3$ $\Rightarrow p < 0 \Rightarrow (a, b) = (1, 3)$ ✓
 $f(2) = 1 - 12 - 2 + 3 = -10$
 \rightarrow نقطه صاف = 2 $\Rightarrow \boxed{-3}$ ✓

$\text{به ازای هر مقدار } n \Rightarrow$
 $\Rightarrow a < 0 \rightarrow a - 1 < 0 \Rightarrow a < 1$
 $\Delta < 0 \rightarrow (a-1)^2 - 4(a-1) < 0 \Rightarrow a^2 - 4a + 4 < 0$
 $\Rightarrow \frac{1}{+} - \frac{5}{-} + \Rightarrow a: (1, 5)$

$(-\infty, 1) \cap (1, 5) = \emptyset$ ✓

$$\frac{m(m^r + m)}{m-r} > 0 \Rightarrow \frac{m^r(m^r + 1)}{m-r} > 0$$

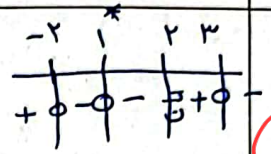


$$\Rightarrow m: (r, +\infty) \quad \checkmark$$

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$$\frac{|n^r - n - 4|}{(n-1)^r} < 0 \Rightarrow \frac{(n-r)(n+r)/(n-1)^r}{(n^r + n + 1)/(r-n)^r} < 0$$



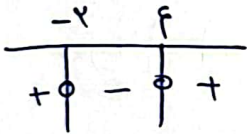
$$n: [-r, 1) \cup [r, +\infty) \quad \checkmark$$

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$$\Rightarrow \frac{3m^r - 2m}{m^r + 4} < r \Rightarrow \frac{3m^r - 2m}{m^r + 4} - r < 0$$

$$\Rightarrow \frac{3m^r - 2m - 2m^r - 4}{m^r + 4} < 0 \Rightarrow \frac{m^r - 2m - 4}{m^r + 4} < 0 \Rightarrow \frac{(m-4)(m+3)}{m^r + 4} < 0$$



$$(a, b) = (-r, f) \quad \checkmark$$

$$b - a = f - (-r) = 4 \quad \checkmark$$

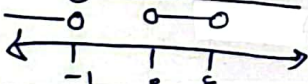
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$$-1 < \frac{3n^r - fn}{n+1} < 0 \rightarrow \frac{n(3n-f)}{n+1} < 0 \Rightarrow n: (-\infty, -1) \cup (0, \frac{f}{3})$$

$$\text{ب) } -1 < \frac{3n^r - fn}{n+1} \Rightarrow \frac{3n^r - fn + n + 1}{n+1} > 0 \Rightarrow \frac{3n^r - 2n + 1}{n+1} > 0$$

$$\text{واری} = \text{الف} \cap \text{ب} = (-\infty, -1) \cup (0, \frac{f}{3}) \cap (-1, +\infty)$$



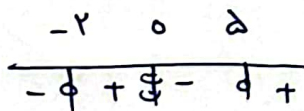
$$\Rightarrow n: (0, \frac{f}{3}) \quad \checkmark$$

$$n: (-1, +\infty)$$

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$$\frac{n^r - 1}{n} < r \Rightarrow \frac{n^r - 1}{n} - r < 0 \Rightarrow \frac{n^r - 1 - rn}{n} < 0 \Rightarrow \frac{(n-r)(n+r)}{n} < 0$$



$$\Rightarrow n: (-\infty, -r] \cup (0, a] \quad \checkmark$$

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