(۱

$$\frac{L}{w}=\frac{5}{4} \Rightarrow 5w=4L \qquad w=\frac{4}{5}L \qquad S_1=L\cdot w=L\cdot\left(\frac{4}{5}L\right)=\frac{4}{5}L^2$$

$$\varphi=\frac{1+\sqrt{5}}{2} \qquad \text{طول جدید}=L' \qquad \frac{L'}{w}=\varphi \rightarrow L'=\varphi\cdot w=\varphi\cdot\left(\frac{4}{5}L\right)$$

$$A_2=L'\cdot w=\left(\frac{4}{5}L\cdot\varphi\right)\left(\frac{4}{5}L\right)=\frac{16}{25}\varphi L^2 \qquad \frac{A_2}{A_1}=\frac{\frac{16}{25}\varphi L^2}{\frac{4}{5}L^2}=\frac{5\times16\varphi}{4\times25}$$

$$\Rightarrow \frac{4}{5}\varphi=\frac{4}{5}\times\frac{1+\sqrt{5}}{2}=\frac{2+2\sqrt{5}}{5}$$

(۲

طول مستطیل $=a$ ، عرض $=b$ ، $b>a$

$$\frac{\text{قطر}}{\text{طول}}=\varphi=\frac{1+\sqrt{5}}{2} \rightarrow \text{قطر}=\sqrt{a^2+b^2} \rightarrow \frac{\sqrt{a^2+b^2}}{a}=\varphi \xrightarrow{\text{توان ۲}} a^2+b^2=\varphi^2a^2 \rightarrow$$

$$b^2=\varphi^2a^2-a^2=(\varphi^2-1)a^2 \quad (1+\varphi=\varphi^2) \rightarrow \varphi^2-1=(\varphi+1)-1=\varphi \rightarrow b^2=\varphi a^2$$

$$\frac{a}{b}=r \quad \xrightarrow{a^2\varphi=b^2} b=\sqrt{\varphi}\,a \ (a>0,b>0) \rightarrow \frac{a}{b}=\frac{1}{\sqrt{\varphi}} \rightarrow r=\frac{1}{\sqrt{\varphi}} \rightarrow r^2=\left(\frac{1}{\sqrt{\varphi}}\right)^2=\frac{1}{\varphi}$$

$$\frac{1}{\varphi}=\frac{\sqrt{5}-1}{2}=1-\varphi=\frac{1}{\varphi} \rightarrow r^2=\frac{\sqrt{5}-1}{2}$$

(۳

$$\left(\sqrt{2a^2+4a}\right)^2=(2-3a)^2 \Rightarrow 2a^2+4a=4-12a+9a^2 \qquad 7a^2-16a+4=0 \Rightarrow a^2-16a+28=0$$

$$(a-14)(a-2)=0 \rightarrow a=\frac{14}{7}\ \times \qquad a=\frac{2}{7}\ \checkmark \qquad \frac{a+1}{a}=\frac{\frac{2}{7}+1}{\frac{2}{7}}=4{,}5$$

(۴

$$\frac{\sqrt{n+1}}{\sqrt{n-1}+3}-\frac{\sqrt{n+1}}{3-\sqrt{n-1}}=\frac{n-1}{\sqrt{n-1}} \Rightarrow \frac{(\sqrt{n+1})(3-\sqrt{n-1})-(\sqrt{n+1})(\sqrt{n-1}+3)}{3(\sqrt{n-1})\ (-\sqrt{n-1})}$$

$$\Rightarrow \frac{(3-\sqrt{n-1})(\sqrt{n+1})-(3+\sqrt{n-1})(\sqrt{n+1})}{10-n}=(\sqrt{n+1})(3-\sqrt{n-1})-3-\sqrt{n-1}$$

$$\Rightarrow (\sqrt{n+1})(\cancel{3}-\sqrt{n-1}-\cancel{3}-\sqrt{n-1})=-2\sqrt{n+1}\ \ -2\sqrt{n-1} \qquad \frac{-2\sqrt{n+1}}{10-n}=\frac{n-1}{\sqrt{n-1}}\ (\sqrt{n-1})(\sqrt{n+1}) \Rightarrow \frac{-2\sqrt{n+1}}{10-n}=\sqrt{n+1}$$

$$\Rightarrow (10-n)(\cancel{\sqrt{n+1}})=-2(\cancel{\sqrt{n+1}}) \Rightarrow 10-n=-2 \Rightarrow n=12$$

(۵

$$\frac{1}{\sqrt{2-n}+2}-\frac{1}{2-\sqrt{2-n}}=\frac{2-n}{5\sqrt{2-n}} \Rightarrow \frac{(2-\sqrt{2-n})-(\sqrt{2-n}+2)}{4-(2-n)} \Rightarrow \frac{\cancel{2(-2\sqrt{2-n})}\ -4\sqrt{2-n}}{2+n}=\frac{2-n}{5\sqrt{2-n}}$$

$$4-n^2=-20(2-n) \Rightarrow 4-n^2=-40+20n$$

$$n^2+20n-44=0$$

$$(n+20)(n-2) \qquad n=-20 , \quad n=2$$

(6

$$\frac{1}{x^2}+\frac{1}{(1-x)^2}=\frac{160}{9} \qquad x^2=a^2 \qquad (1-x)^2=b^2$$

$$\frac{a^2+b^2}{a^2b^2}=\frac{(a+b)^2-2ab}{a^2b^2}=\frac{x+1-x-2(x)(1-x)}{a^2b^2}=\frac{1-2x+2x^2}{a^2b^2}=\frac{2x^2-2x+1}{a^2b^2}$$

$$=\frac{x^2-2x+2}{\cancel{a^2b^2}}$$

$$\frac{x^2-2x+2}{x^2(x-1)^2}=\frac{x^2-2x+2}{x^2(1-2x+x^2)}=\frac{2x^2-2x+1}{x^2(x^2-2x+1)}$$

(7

$$-x^3+4x^2+25x-100\geq 0 \qquad (x^2-25)(4-x)\geq 0 \qquad x^2=25 \Rightarrow x=\pm 5$$

$$x=4$$

	-5		4		5	
$+$		$-$		$+$		$-$

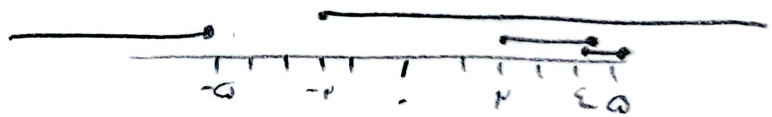
$$[-\infty,-5]\cup[4,5]$$

$$-x^2-6x-8\geq 0 \rightarrow -(x^2-6x+8)\geq 0 \qquad x^2-6x+8\leq 0 \rightarrow (x-4)(x-2)=0$$

$$x=2,4$$

	2		4	
$-$		$-$		$+$

$$[2,4]$$



جواب $=\boxed{4}$

$y=|x+۲|+|x-۱|$, $۳y+x=۱۷$ $y=-\frac{۱}{۳}x+\frac{۱۷}{۳}$ (۸

$-\frac{۱}{۳}x+\frac{۱۷}{۳}=|x+۲|+|x-۱|$

$|x+۲|+|x-۱|+\frac{۱}{۳}x=\frac{۱۷}{۳}$

① $x\leq -۲ \rightarrow -x-۲-x+۱+\frac{۱}{۳}x=\frac{۱۷}{۳} \rightarrow -\frac{۵}{۳}x=\frac{۲۰}{۳} = x=-۴$ ✓

② $-۲\leq x<۱ \rightarrow x+۲-x+۱+\frac{۱}{۳}x=\frac{۱۷}{۳} \rightarrow x=\frac{۱۷}{۱۰}=+۱,۷$ غ ق ق

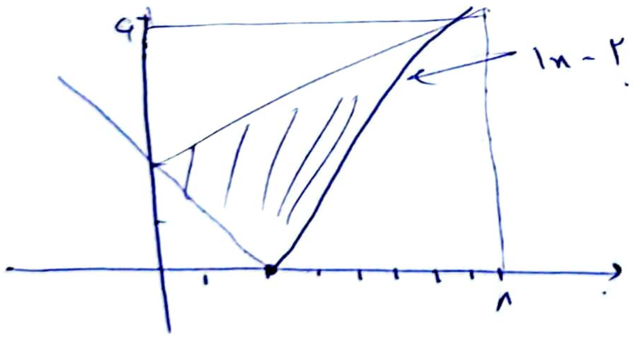
③ $x\geq ۱ \rightarrow x+۲+x-۱+\frac{۱}{۳}x=\frac{۱۷}{۳} \rightarrow x=۲$ ق ق

$y=\sqrt{x^۲-۴x+۴}=\sqrt{(x-۲)^۲}=|x-۲|$ $x\geq ۲$ (۹

$y=\frac{۱}{۲}x+۲ \rightarrow \frac{۱}{۲}x+۲=|x-۲| \rightarrow$

$x-۲=\pm(\frac{۱}{۲}x+۲)$

$$\begin{cases} x-۲=\frac{۱}{۲}x+۲ \rightarrow x=۸ & \underline{(۸,۶)} \\ x-۲=-\frac{۱}{۲}x-۲ \rightarrow \frac{۳}{۲}x=۰ \rightarrow x=۰ & (۰,۲) \end{cases}$$



$\frac{۱}{x}+\frac{۱}{x-۹}=\frac{۱}{۲۰}$ فرهاد $x-۹$, x بهروز (۱۰

$\frac{\overset{۲x-۹}{\cancel{x-۹+x}}}{x^۲-۹x}=\frac{۱}{۲۰} \rightarrow x^۲-۹x=۴۰x,-۱۸۰ \rightarrow x^۲-۴۱x-۱۸۰=۰$

$(x-۳۶)(x-۵)=۰ \rightarrow (x-۳۶)(x-۵)=۰$

$$\begin{cases} x=۳۶ ✓ \\ x=۵ \end{cases}$$ غ ق ق