

$$y = -x^2 + bx + 3$$

$$\max = 7 \rightarrow y_{\max} = \frac{-\Delta}{4a} = \frac{-(b^2 - 4ac)}{4a} = \frac{-(b^2 + 12)}{-4} = 7 \rightarrow b^2 + 12 = 28$$

$$b = ? \Rightarrow b^2 = 16 \Rightarrow b = \pm 4 \checkmark$$

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الف) $f(x) = x^2 + 2x^2 + 3 \xrightarrow{\text{تغییر متغیر}} x^2 = t \rightarrow f(t) = t^2 + 2t + 3 \rightarrow t = \frac{-2 \pm \sqrt{4 - 12}}{2}$

$$\Rightarrow \Delta = b^2 - 4ac = 4 - 12 < 0 \rightarrow \text{این معادله فاقد ریشه است.} \checkmark$$

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ب) $f(x) = (5 - x^2)^2 - 2(5 - x^2) - 15 \xrightarrow{\text{تغییر متغیر}} 5 - x^2 = t \rightarrow f(t) = t^2 - 2t - 15$

$$\xrightarrow{\text{ساده کردن}} (t - 5)(t + 3) \rightarrow t \begin{cases} t = -3 \rightarrow 5 - x^2 \rightarrow x^2 - 5 = 0 \rightarrow x = \pm \sqrt{5} \checkmark \\ t = 5 \rightarrow 5 - x^2 \rightarrow x^2 + 1 = 0 \rightarrow x^2 = -1 \text{ غلط } \times \end{cases}$$

$$x^2 - 14x + m = 0 \rightarrow \begin{cases} S = \alpha + \beta = -\frac{b}{a} = \frac{14}{1} = 14 \\ P = \alpha \cdot \beta = \frac{c}{a} = \frac{m}{1} \end{cases}$$

$$\alpha, \alpha + 2 = \beta \quad \alpha + \beta = 14 = 2\alpha + 2 \rightarrow 4\alpha = 12 \rightarrow \alpha = 3 \checkmark \quad \beta = \alpha + 2 = 5 \checkmark$$

$$m = ? \quad \alpha = ? \quad \beta = \alpha + 2 = ? \Rightarrow P = \alpha \cdot \beta = 3 \times 5 = 15 = \frac{m}{1} \Rightarrow m = 15 \checkmark$$

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$$x^2 - 4x + m - 1 = 0 \rightarrow \begin{cases} \alpha + \beta = 4 \\ \alpha \beta = m - 1 \end{cases} \xrightarrow{\text{حساب کردن با آسانی}} 4\alpha - \beta = 4 \rightarrow \alpha = \frac{\beta}{4} + 1$$

$$m = ? \Rightarrow \alpha + \beta = \beta + \frac{\beta}{4} + 1 = 4 \rightarrow \frac{5}{4}\beta = 3 \rightarrow \beta = 0$$

$$\alpha \beta = \beta \left(\frac{\beta}{4} + 1 \right) = \frac{\beta^2}{4} + \beta = \frac{m-1}{4} \xrightarrow{\beta=0} \frac{0}{4} + 2(0) = 0 = \frac{m-1}{4} \rightarrow m = 1 \checkmark$$

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$$-mx^2 + 4x + m^2 - 2 = 0 \rightarrow P = \frac{c}{a} = \frac{m^2 - 2}{-m} = 1 \rightarrow m^2 + m - 2 = 0$$

$$\alpha = \alpha \quad \beta = \frac{1}{\alpha} \rightarrow P = \alpha \cdot \beta = \alpha \times \frac{1}{\alpha} = 1 \quad m = \frac{-1 \pm \sqrt{1 + 4}}{2} = \frac{-1 \pm 3}{2}$$

$$\Rightarrow m = -2 \rightarrow 2x^2 + 4x + 2 \rightarrow \Delta = 16 - 16 = 0 \rightarrow \text{یک ریشه} \rightarrow \text{غلط } \times$$

$$\Rightarrow m = 1 \rightarrow -x^2 + 4x - 1 \rightarrow \Delta = 16 - 4 = 12 > 0 \rightarrow \text{دو ریشه} \rightarrow \text{درست } \checkmark$$

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$$x^r - mx + r = 0 \rightarrow \begin{cases} \alpha + \beta = m \\ \alpha \cdot \beta = r = p \end{cases}$$

$$\alpha \beta^r = f$$

$$m = ? \rightarrow \alpha \beta \times \beta = p \times \beta = r \beta = f \rightarrow \boxed{\beta = \frac{f}{r}} \rightarrow \alpha \left(\frac{f}{r}\right)^r = f$$

$$\Rightarrow \begin{cases} \alpha = \frac{q}{r} \\ \beta = \frac{f}{r} \end{cases} \rightarrow m = \alpha + \beta = \frac{q}{f} + \frac{f}{r} = \frac{rv + 14}{12} = \frac{f \cdot r}{12} \rightarrow \alpha = \frac{f}{\frac{14}{q}} = \frac{q}{f}$$

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$$x^r - fx + m = 0 \rightarrow \begin{cases} \alpha + \beta = f \\ \alpha \beta = m \end{cases}$$

$$\alpha = \alpha$$

$$\beta = r\alpha$$

$$m = ?$$

$$\alpha \beta = r\alpha^r \rightarrow r\alpha^r = r(1)^r = r = m$$

$$\alpha + \beta = f\alpha = f \rightarrow \boxed{\alpha = 1}$$

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$$x^r - vx + r = 0 \rightarrow \begin{cases} \alpha^r = (q)^3 \\ \frac{1}{\alpha^r} = \left(\frac{r}{\alpha}\right)^r \end{cases} \rightarrow \alpha^r + \frac{1}{\alpha^r} = \left(\alpha + \frac{r}{\alpha}\right)^r - 4\alpha - \frac{1r}{\alpha} = \left(\alpha + \frac{r}{\alpha}\right)^r - 4\left(\alpha + \frac{r}{\alpha}\right)$$

$$\alpha^r + \frac{1}{\alpha^r} = f \Rightarrow \alpha + \frac{r}{\alpha} = \frac{\alpha^r + \frac{1}{\alpha^r}}{\alpha} = \frac{v\alpha}{\alpha} = v$$

$$\alpha^r - v\alpha + r = 0 \rightarrow \alpha^r + r = v\alpha$$

$$\Rightarrow \left(\alpha + \frac{r}{\alpha}\right)^r - 4\left(\alpha + \frac{r}{\alpha}\right) = (v)^r - 4(v) = rfr - fr = r01$$

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$$h(t) = -10t^r + \omega_0 t$$

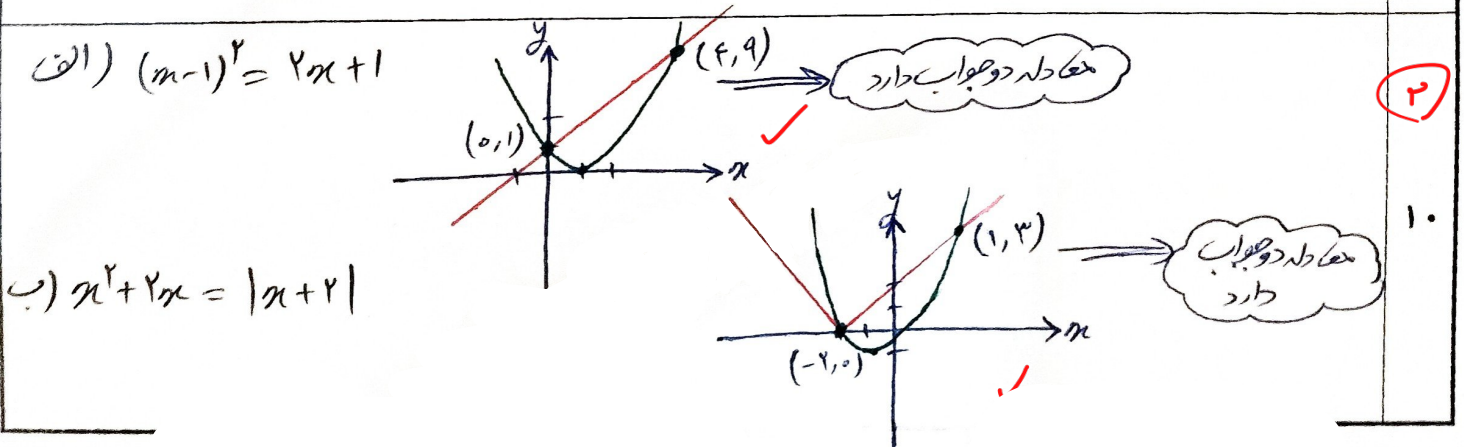
$$h_{max} = ? \rightarrow h_{max} = \frac{-\Delta}{fa} = \frac{-(b^r - 4ac)}{fa} = \frac{-(2\omega_0^2 - 0)}{f \cdot 0} = \frac{2\omega_0^2}{f} = 42, \omega$$

$$t_{\text{max}} = ?$$

$$\xrightarrow{h=0} h=0 \rightarrow -10t^r + \omega_0 t = 0 \rightarrow \omega_0 t = 10t^r \rightarrow \boxed{t = \omega}$$

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