

۱

$$\begin{aligned} (9, x+2y), (2x-y, -2) \rightarrow 9 = 2x-y \rightarrow 18 = 4x-2y \\ -2 = x+2y \end{aligned} \left. \begin{aligned} -2 = x+2y \rightarrow -2 = 2+2y \\ -4 = 2y \rightarrow y = -2 \end{aligned} \right\} \frac{x}{y} = \frac{2}{-2} = \boxed{-1}$$

$$\begin{aligned} (-1, -2), \left(\frac{1}{x}-\frac{1}{y}, \frac{5}{x}-\frac{4}{y}\right) \rightarrow -1 = \frac{1}{x}-\frac{1}{y} \rightarrow (-5 = \frac{5}{x}-\frac{4}{y}) \rightarrow -5 = \frac{5}{x}-\frac{4}{y} \rightarrow -5 = \frac{5}{x} + \frac{4}{y} \\ -2 = \frac{5}{x}-\frac{4}{y} \end{aligned} \left. \begin{aligned} -5 = \frac{5}{x} + \frac{4}{y} \\ -10 = \frac{5}{x} \rightarrow x = -\frac{1}{2} \end{aligned} \right\} \frac{x}{y} = \frac{-\frac{1}{2}}{-1} = \frac{1}{2} = \boxed{\frac{1}{2}}$$

$$2 = -\frac{2}{y} \rightarrow y = -1 \rightarrow \frac{x}{y} = \frac{-\frac{1}{2}}{-1} = \frac{1}{2} = \boxed{\frac{1}{2}}$$

۲

$$a+1 = -2 \rightarrow a = -3 \quad \{(-2, -4), (1, -2), (1, -2), (1, -2), (1, b)\}$$

$$\left. \begin{aligned} f(a) = f(-2) = 2x-3 = -4 \\ f(1) = -2 \end{aligned} \right\} f(a) + 2f(2) = 3f(1) \rightarrow -4 + 2f(2) = 3x-2 \rightarrow -4 + 2f(2) = -4 \rightarrow 2f(2) = 0 \rightarrow f(2) = 0 \rightarrow b = 0$$

۳

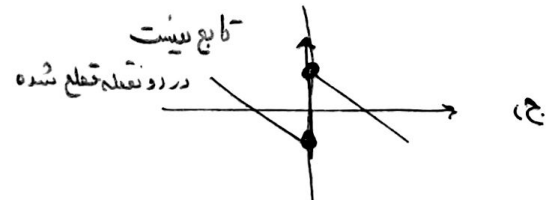
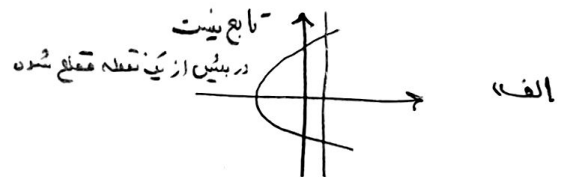
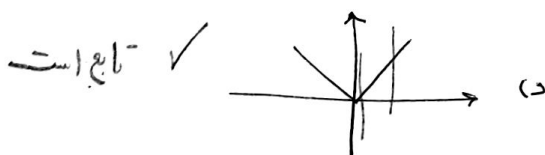
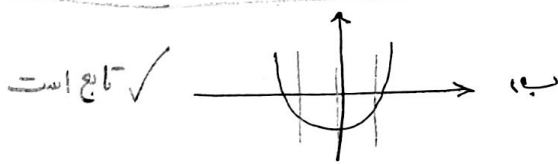
$$m^2 - 3m = -2 \rightarrow m^2 - 3m + 2 = 0 \rightarrow (m-1)(m-2) = 0 \rightarrow \begin{cases} m=2 \\ m=1 \end{cases}$$

$$\underline{a} \ m=2 \rightarrow m+1 = 2+1 = 3 \rightarrow (3, 4), (3, 5) \rightarrow \text{تابع نیست}$$

$$\underline{b} \ m=1 \rightarrow m+1 = 1+1 = 2 \rightarrow (2, 4), (2, 3) \rightarrow \text{تابع نیست}$$

پس به ازای هیچ مقداری

۴



۵

$$y = \sqrt{x+1} \text{ (الف)}$$

$$\left. \begin{aligned} y_1 = -\sqrt{x+1} \\ y_2 = \sqrt{x+1} \end{aligned} \right\} y_1 = y_2 \text{ تابع است} \checkmark$$

$$\text{ب) } x = \frac{y}{\sqrt{1-y^2}} \xrightarrow{\text{ضرب طرفین}} x = 1 \rightarrow 1 = \frac{y}{\sqrt{1-y^2}} \rightarrow (\sqrt{1-y^2})^2 = (y)^2 \rightarrow 1-y^2 = y^2 \rightarrow 1 = y^2 \rightarrow y = \pm 1 \text{ تابع نیست}$$

تابع  $y = \pm 1$  تابع  $y = \pm 1$   $\rightarrow$   $|y| = 1$   $\rightarrow$   $|x| = x$   $\rightarrow$   $x = \pm 1$

دو طرف به علامت ۱۵

ب)  $y^3 + 3y^2 + 3y + x^3 + x = 0$   $\xrightarrow{\text{تعریف رابن}} (y_1)^3 + 3(y_1)^2 + 3(y_1) = -x^3 - x$   $\left. \begin{array}{l} (y_2)^3 + 3(y_2)^2 + 3(y_2) = -x^3 - x \\ (y_1)^3 + 3(y_1)^2 + 3(y_1) = -x^3 - x \end{array} \right\} y_1^3 + 3y_1^2 + 3y_1 = y_2^3 + 3y_2^2 + 3y_2 + 1$   
 $(y_1 + 1)^3 = (y_2 + 1)^3$   
 $y_1 + 1 = y_2 + 1 \rightarrow y_1 = y_2$   $\checkmark$  تابع است

$$\frac{(\sqrt{3}-2)^3 + 3(\sqrt{3}-2) + a}{(\sqrt{3}-2)^3 + 3(\sqrt{3}-2) + v} = \frac{3+3-4\sqrt{3}+4\sqrt{3}-1+a}{3+3-4\sqrt{3}+4\sqrt{3}-1+v} = \frac{-1+a}{-1+v} = \frac{4}{4} = \frac{2}{2}$$

$y = 3x - a \rightarrow -4 = 3(-1) - a \rightarrow -4 = -3 - a \rightarrow a = 1$

$f(-1) = (-1)^3 - a + b = -4 \rightarrow -1 - (+1) + b = -4 \rightarrow b = -2$

$f(x) = x^3 + x - 2 \quad | \quad x^3 + x - 2 = 3x - 1 \rightarrow x^3 - 2x + 1 = 0$

$y = 3x - 1$   

$$\begin{array}{r} x^3 - 2x + 1 \quad | \quad x + 1 \\ -x^3 + x^2 - 1 \\ \hline x^2 - x - 1 \\ -x^2 + x + 1 \\ \hline -x - 1 \end{array} \quad (x+1)(x^2-x-1) \rightarrow -\frac{b}{ka} = \frac{-(-1)}{2} = \frac{1}{2}$$

در تابع ثابت به ازای هر  $x$  خود می تابتی به دست می آید. ۹

$a + b = 2a$   
 $b = a$

$2a = a - 2b + 1 \rightarrow 2a = a - 2(a) + 1 \rightarrow 2a = a - 2a + 1 \rightarrow 2a = -a + 1$   
 $3a = 1 \rightarrow a = \frac{1}{3}$

$f(x) = 3x$

$f(x) = \frac{3x^2 - ax + c + 1}{bx + 2} = x \rightarrow 3x^2 - ax + c + 1 = bx^2 + 2x$   
 $b = 3 \quad a = -3 \quad c = -1$   
 $a + b + c = 3 - 3 - 1 = 0$

۱۵