

$u(fu) \geq 0$	u	$[-5, 0]$	$[0, 1]$	$[1, 5]$	$[-4, -5]$	$D_f = [1, 5] \cup [-5, 0]$	۱
	u	-	+	+	-		
	$f(u)$	-	-	+	+		
	$u(fu)$	+	-	+	-		

$\frac{-u}{f(u)} \geq 0, f(u) \neq 0$	u	$[-4, -3]$	$(-3, 0)$	$(0, 2)$	$(2, 5)$	$D_f = (-5, 0) \cup (0, 2)$	۲
	$-u$	+	+	-	-		
	$f(u)$	-	+	-	+		
	$\frac{-u}{f(u)}$	-	+	+	-		

$u=2$	$f(1) - 2f(2) = 4 - 6 + 4 = -2$	$-f(2) = 2 \rightarrow f(1) = -2$	۳
$u=-1$	$f(-1) - 2f(2) = 4 + 6 + 4 = 14$	$f(-1) - 2(-2) = 14$	
	$f(-1) + 4 = 14 \rightarrow f(-1) = 10$		

$u=1 \Rightarrow u \leq 3 \rightarrow 2u+3 \rightarrow 2(1)+3=5$	$if u=5 \rightarrow u \geq 3 \rightarrow u - \sqrt{u+4}$	۴
$\Rightarrow 5 - \sqrt{5+4} = 5 - \sqrt{9} = 5 - 3 = 2$	$وقتی f(f(1)) = 2$	
$f(5) = 2$	$if u=2 \rightarrow u \leq 3 \rightarrow 2u+3 \rightarrow 2(2)+3=7$	

$f(u-1) = a(u-1)^2 - b(u-1) + 2 \rightarrow a(u^2 - 2u + 1) - bu + b + 2$	۵
$\Rightarrow au^2 - 2au + a - bu + b + 2$	
$f(u) = au^2 - bu + 2$	
$f(u-1) - f(u) = au^2 - 2au + a - bu + b + 2 - au^2 + bu - 2$	
$-2au + a + b = 4u + 2$	

$$f(3) = 3^2 - 3(3) + 1 = 9 - 9 + 1 = 1$$

$$f(-1) = (-1)^2 - 3(-1) + 1 = 5$$

$$f(2) = (2)^2 - 3(2) + 1 = -1$$

$$\frac{2f(2) + f(-1)}{f'(2)} = \frac{2(-1) + 5}{(-1)^2} = \sqrt{\quad}$$

6

$$u = 4 \rightarrow u > 2 \rightarrow 3u + 1 = 3(4) + 1 = 13$$

$$u = -2 \rightarrow u < 2 \rightarrow 3u + 1 = 3(-2) + 1 = -5$$

$$u = 2 \rightarrow u \geq 2 \rightarrow 3u + 1 = 3(2) + 1 = 7$$

$$\frac{3f(4) - 2f(-2)}{f(2)}$$

$$\Rightarrow \frac{3(13) - 2(-5)}{7} = \frac{51}{7}$$

7

$$f(4) = 1 \quad f(1) = 4 \rightarrow f(f(4)) = 4$$

$$f(3) = 2 \quad f(2) = 4 \rightarrow f(f(3)) = 4$$

$$f(1) = 4$$

$$\frac{4-4}{4-2} = \frac{0}{2} = 0$$

$$\frac{f(f(4)) - f(f(3))}{f(1) - 2}$$

8

$$f(u) = \frac{(u^2 + 4u + 5) + 4}{u^2 + 4u + 5} = 1 + \frac{4}{u^2 + 4u + 5}$$

$$u = \sqrt{3} - 2 \rightarrow u + 2 = \sqrt{3} \rightarrow (u+2)^2 = (\sqrt{3})^2 = u^2 + 4u + 4 = 3$$

$$f(\sqrt{3} - 2) = 1 + \frac{4}{(-1) + 5} = \boxed{2}$$

$$\rightarrow u^2 + 4u = -1$$

9

$$f(\sqrt{u}) = (\sqrt{u})^2 + \frac{1}{(\sqrt{u})^2} = u + \frac{1}{u} \quad (f(\sqrt{u}))^2 = (u + \frac{1}{u})^2 = u^2 + \frac{1}{u^2} + 2$$

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

10