

$$x f(x) \geq 0$$

x	-4	-2	0	2	4
x	-	-	0	+	+
f(x)	+	0	-	-	0
xf(x)	-	0	+	-	0

$$x \in [-\infty, 0] \cup [2, \infty]$$

$$D_f = [-\infty, 0] \cup [2, \infty]$$

$$\frac{-x}{f(x)} \geq 0$$

x	-4	-2	0	2	4
-x	+	+	0	-	-
f(x)	-	0	+	-	0
$\frac{-x}{f(x)}$	-	0	+	+	+

$$D_f = (-\infty, 0) \cup (2, \infty)$$

$$x = -4 \quad f(x) = -1 \quad \frac{-x}{f(x)} = 4$$

$$f(x) \neq 0$$

$$-x = -(-4) = 4$$

$$\frac{-x}{f(x)} = \frac{4}{-1} = -4$$

$$if \quad x = 2$$

$$f(2) - 2f(2) = 4 - 4 + 4$$

$$-f(2) = 2 \rightarrow -2f(2) = 4$$

$$if \quad x = -2$$

$$f(-2) + 2 = 4 + 4 + 4$$

$$f(-2) + 4 = 14$$

$$f(-2) = 10$$

$$f(0) = 0 - \sqrt{2+4} = 0 - \sqrt{6} = -\sqrt{6}$$

$$f(1) = 1 \times 1 + 4 = 5$$

$$f(1) = 1 \times 1 + 4 = 5$$

$$f(2) = 2$$

$$2 + 2 = 4$$

$$f(x-1) = a(x-1)^2 - b(x-1) + 2 = a(x^2 - 2x + 1) - b(x-1) + 2$$

$$= ax^2 - 2ax + a - bx + b + 2 = ax^2 - (2a+b)x + (a+b+2)$$

$$f(x-1) - f(x) = (ax^2 - (2a+b)x + (a+b+2)) - (ax^2 - bx + 2)$$

$$= -(2a+b)x + (a+b+2) - (-bx + 2) = -2ax - ax + a + b = -3ax - a + b$$

$$-3ax - a + b = 4x + 2$$

$$-3a = 4 \quad a = -\frac{4}{3}$$

$$a + b = 2 \quad b = 2 - a = 2 + \frac{4}{3} = \frac{10}{3}$$

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

$$\frac{x^r + 1}{x^r} = x^r + \frac{1}{x^r}$$

(v)

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

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

$$f(x) = x^r + r$$

$$f(-3) = (-3)^r + r = 9 + r = 11$$

الف) $\frac{f}{g} = \{(2, \frac{0}{\sqrt{5}}), (1, -\sqrt{2}), (0, \frac{4}{5})\}$

(v)

ب) $\frac{g}{f} = \{(2, \frac{\sqrt{5}}{0}), (1, -\frac{\sqrt{2}}{r}), (0, \frac{4}{r})\}$

الف) $r f(x) = \{(2, 2)(3, 8)(-5, 4)(1, -4)\}$

ب) $f(x) + 1 = \{(2, 2)(3, 5)(-5, 4)(1, -1)\}$ (9)

ج) $r^2 f^r(x) + 1 = \{(2, 4)(3, 49)(-5, 14)(1, 14)\}$

د) $f(rx) = \{(1, 1)(\frac{r}{r}, 4)(\frac{-5}{r}, 2)(\frac{1}{r}, -2)\}$

الف) $f - g = \{(2, 2)(1, 4)(3, 2)\}$

(10)

ب) $\frac{r f}{g} = \{(2, 4)(1, \frac{4}{0})(3, -2)\}$