

ا) $x \neq 0, x \neq 1, \frac{x-1}{x} - \frac{x}{x-1} \geq 0 \Rightarrow \frac{-2x+1}{x(x-1)} \geq 0$
 $\frac{0}{+} \frac{+}{+} \frac{+}{-} \Rightarrow D_f = (-\infty, 0) \cup [\frac{1}{2}, 1)$

ب) $x \neq -1, x \neq 0, x \neq 1, x \neq 2$

$\frac{3}{x-1} + \frac{1}{x+2} \neq 0 \Rightarrow \frac{4x+5}{(x-1)(x+2)} \Rightarrow x \neq -\frac{5}{4} \quad D_f = \mathbb{R}$

ا) $((\frac{1}{3})^x - 9)(32 - 4^x) \geq 0 \Rightarrow D_f = [-\infty, -2] \cup [2.5, +\infty)$
 $-2 \quad \frac{5}{2} \quad -2 \quad 2.5$
 $+ \quad - \quad + \quad +$

ب) $x-1 \geq 0 \Rightarrow x \geq 1$
 $\sqrt[5]{x+1} = 3 - \sqrt[4]{x-1} \Rightarrow \sqrt[4]{x-1} \leq 3 \Rightarrow x-1 \leq 81$
 $\Rightarrow x \leq 82 \Rightarrow D_x = [1, 82]$

$x^2 - x - 2 > 0 \Rightarrow (x-2)(x+1) > 0 \Rightarrow \frac{-1}{+} \frac{-2}{-} \Rightarrow D = (-\infty, -1) \cup (2, +\infty)$
 $x^2 - 1 \geq 0 \Rightarrow D = (-\infty, -1] \cup [1, +\infty)$

$\Rightarrow D_f = (-\infty, -1) \cup (2, +\infty)$

$ax^2 + bx + c \leftrightarrow \begin{cases} P = \frac{c}{a} \\ S = -\frac{b}{a} \end{cases}$

$P = -2b = \frac{3}{-1} = -3 \Rightarrow b = \frac{3}{2} = 1.5$
 $S = -2 + b = \frac{a}{-1} = a = -2a = -0.5$

$a + b = 1$

$f(x) \geq x \quad x \in \mathbb{R}$

$x \geq 1 \Rightarrow 3x - 2 \geq x \Rightarrow x \geq 1$

$x < 1 \Rightarrow 2x + 3 \geq x \Rightarrow x \geq -3 \Rightarrow [-3, 1)$

$\Rightarrow D = [-3, +\infty)$

$$\sin \frac{\pi}{2} + \cos 2\pi = \frac{\sqrt{3}}{2} + 1$$

$$f(n) = 2n(n-2)$$

$$= 2 \left(\frac{\sqrt{3}}{2} + 1 \right) \left(\frac{\sqrt{3}}{2} - 1 \right) = 2 \left(\frac{3}{4} - 1 \right) = \left(-\frac{1}{2} \right)$$

$$f(f(n)) = \frac{\frac{n+1}{n-1} + 1}{\frac{n+1}{n-1} - 1} = \frac{\frac{2n}{n-1}}{\frac{2}{n-1}} = n$$

$$\Rightarrow f(n) = n \rightarrow n \in D_f$$

$$D_f = \mathbb{R} - \{1\} \Rightarrow \boxed{\mathbb{R} - \{1\}}$$

$$(g(a))^2 - 4g(a) + 4 = 0 \Rightarrow (g(a) - 2)^2 = 0 \Rightarrow g(a) = 2$$

$$\sqrt{a^2 - 1} = 2 \Rightarrow a^2 - 1 = 4 \Rightarrow a^2 = 5 \Rightarrow a = \pm \sqrt{5}$$

$$f(4) = f(1+3) = 1 + 5 + 6 = 12$$

$$f(-3) = f(-6+3) = 36 + 30 + 6 = 72$$

$$72 \times 2 = \boxed{144}$$

$$4\cos^2 x + 5\cos x = 3,5$$

$$f(3,5) = 3 \quad \leftarrow$$

$$\Rightarrow 8\cos^2 x + 10\cos x - 7 = 0 \Rightarrow 8t^2 + 10t - 7 = 0$$

$$\Rightarrow \frac{-b \pm \sqrt{\Delta}}{2a} = \frac{-10 \pm \sqrt{100 - 4 \times 8 \times (-7)}}{2 \times 8} = \frac{-10 \pm 18}{16}$$

$$\Rightarrow \left(\frac{1}{2} \right) - \frac{1}{5} \quad \cos x = \frac{1}{2} \Rightarrow x = \frac{\pi}{3} \Rightarrow \tan^2 \frac{\pi}{3} = \boxed{3}$$