

1) $\sqrt{\frac{x-1}{x} - \frac{x}{x-1}} = \sqrt{\frac{x^2 - x + 1 - x^2}{x^2 - x}} = \sqrt{\frac{-x+1}{x(x-1)}} \rightarrow \frac{0}{+||-||-} \rightarrow (-\infty, 0) \cup [\frac{1}{2}, 1)$ (1)

2) $\frac{1}{x+1} - \frac{x}{x-1} \rightarrow \frac{x-1}{x^2-1} - \frac{x^2}{x^2-1} \rightarrow \frac{x-1-x^2}{x^2-1} \rightarrow \frac{-x^2+x-1}{x^2-1}$

3) $\frac{1}{x+1} - \frac{x}{x-1} \rightarrow \frac{x-1}{x^2-1} - \frac{x^2}{x^2-1} \rightarrow \frac{-x^2+x-1}{x^2-1}$

4) $\frac{1}{x+1} - \frac{x}{x-1} \rightarrow \frac{x-1}{x^2-1} - \frac{x^2}{x^2-1} \rightarrow \frac{-x^2+x-1}{x^2-1}$

5) $\sqrt{x-1} \rightarrow x \geq 1$ $\sqrt{y+1} \Rightarrow \sqrt{x-1} = y \rightarrow x = y^2 + 1 \rightarrow DA = (1, \infty)$

6) $x^2 - x - 2 > 0 \rightarrow \frac{-1 \pm \sqrt{1+8}}{2} = \frac{-1 \pm 3}{2} \rightarrow x = -1, 2$

7) $x^2 - 1 \geq 0 \rightarrow \frac{-1 \pm \sqrt{1+4}}{2} = \frac{-1 \pm \sqrt{5}}{2}$

8) $\sqrt{x^2-1} \neq 0 \rightarrow \sqrt{x^2-1} \neq -1$

9) $-(-2)^2 + a(-2) + b = 0 \rightarrow -4a = 1 \rightarrow a = -\frac{1}{4}$

10) $a + b = \frac{4}{3} - \frac{1}{3} = 1$

11) $f(x) = x \rightarrow f(x) \geq x \rightarrow x \geq 1$

12) $f(x) = x \rightarrow f(x) \geq x \rightarrow x \geq -1 \Rightarrow -1 \leq x < 1$

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

14) $f(f(a)) = \frac{a+1}{a-1} + 1 = \frac{a+1+a-1}{a-1} = \frac{2a}{a-1} = a \rightarrow a = a \Rightarrow$

15) $f(g(a)) = (\sqrt{a^2+1})^2 - 2\sqrt{a^2+1} = -2 \xrightarrow{\sqrt{a^2+1}=t} t^2 - 2t + 2 = 0 \rightarrow t = 1 \rightarrow \sqrt{a^2+1} = 1$

16) $a^2 = b \rightarrow a = \pm \sqrt{b}$

17) $u^2 = t \rightarrow u = 1 \rightarrow f(1) = 1 - 0 + 4 = 5 \rightarrow f(-1) \times f(1) = 1 \times 5 = 5$

18) $u^2 = t \rightarrow u = -1 \rightarrow f(-1) = 1 + 4 + 0 + 4 = 9$

19) $\cos^2 x + \delta \cos x = \frac{1}{2} \rightarrow \frac{x}{2} + \frac{\delta}{2} = \frac{\pi}{2} \rightarrow \cos x = \frac{1}{2} \Rightarrow \sin x = \frac{\sqrt{3}}{2}$

20) $\tan^2 \frac{\pi}{4} = \left(\frac{\sqrt{3}}{1}\right)^2 = 3$