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مسائل

$$\text{a)} f(x) = \sqrt{\frac{x-1}{x}} - \frac{x}{x-1} \geq 0 \quad \frac{(x-1)^2 - x^2}{x(x-1)} = \frac{x^2 - 2x + 1 - x^2}{x^2 - x}$$

$$= \frac{-2x+1}{x(x-1)} \quad \begin{array}{c} x \\ 0 \quad + \quad \frac{1}{2} \end{array} \quad \text{Df} = (-\infty, 0) \cup [\frac{1}{2}, 1)$$

$-2x+1=0 \quad x=\frac{1}{2}$

$$\text{b)} f(x) = \frac{1}{x+1} - \frac{x}{x}$$

$$\begin{array}{c} \frac{x}{x+1} + \frac{1}{x+1} \\ \frac{x}{x+1} + \frac{1}{x+1} \neq 0 \Rightarrow \frac{x(x+1) + x-1}{(x+1)(x+1)} \neq 0 \\ x^2 + 2x - 1 \neq 0 \quad x \neq -1 \end{array}$$

$$\text{Df} = \mathbb{R} - \{-1, -\frac{1}{2}, -1, 0, 1\}$$

$$\text{c)} f(x) = \left(\left(\frac{1}{x}\right)^x - 9\right)(x^x - 9) \quad \left(\left(\frac{1}{x}\right)^x - 9\right)(x^x - 9) \geq 0 \quad \text{gionnal + maal}$$

$$\left(\frac{1}{x}\right)^x - 9 \geq 0 \quad \frac{1}{x} \geq 9^{\frac{1}{x}} \quad x < -1 \quad \frac{1}{x} > 9^{\frac{1}{x}} \quad \text{Df} = (-\infty, -1) \cup [1, \infty)$$

$$x^x - 9 \geq 0 \quad x^x \geq 9 \quad x^x > 9^{\frac{1}{x}} \quad x \geq 1 \quad \frac{1}{x} > 9^{\frac{1}{x}}$$

$$\text{d)} \sqrt{x-1} + \sqrt{x+1} = x \quad \sqrt{x-1} \geq 0 \quad x \geq 1 \quad \text{Df} = [1, \infty)$$

$$\sqrt{x+1} = x - \sqrt{x-1} \quad ()^2 \quad x+1 = x^2 - 2x\sqrt{x-1} + x-1$$

$$2 = \sqrt{x-1} - 2\sqrt{x-1} + 1 \quad 1 = -\sqrt{x-1} \quad \sqrt{x-1} = -1 \quad x=0$$

$$f(x) = \frac{\log(x^x - x - 1)}{\sqrt{x^x - 1} + 1} \quad x^x - x - 1 > 0 \quad (x+1)(x-1) > 0 \quad \frac{1}{x} > 1 - \frac{1}{x}$$

$$x^x - 1 > 0 \quad x^x > 1 \quad x > 1 \quad x < -1 \quad \sqrt{x^x - 1} + 1 \neq \sqrt{x^x - 1} + -1 \quad \text{Df} = (-\infty, -1) \cup (1, \infty)$$

$$\text{Df} = (-\infty, -1) \cup (1, \infty)$$

$$f(x) = \sqrt{\frac{x^2 - 1}{x^2 - 1 - x^2}} \quad \text{Df} = [-1, 1] \quad a+b=2$$

$$x^2 - 1 - x^2 = 0 \quad -1 = 0 \quad x^2 = 1 \quad x = \pm 1 \quad \sqrt{(x^2 + \frac{1}{x} - 1)}$$

$$\frac{1}{x} = \frac{1}{x} - \frac{1}{x} = -1 \quad -1b = -1 \quad b = \frac{1}{x} \quad a+b = \frac{1}{x} + \frac{1}{x} = \frac{2}{x} = 1$$

$$f(x) = \begin{cases} x^x - 1 & x > 1 \\ x^x + 1 & x < 1 \end{cases} \quad \text{and} \quad g(x) = \sqrt{f(x) - x}$$

$$x > 1 \quad g(x) = \sqrt{x^x - x - 1} = \sqrt{x^x - 1} \geq 0 \quad \text{Df} = [1, \infty)$$

$$x < 1 \quad g(x) = \sqrt{x^x + 1 - x} = \sqrt{x^x + 1} \geq 0 \quad \text{Df} = (-\infty, 1)$$

$$\text{Df} = [1, \infty) \cup (-\infty, 1) = \mathbb{R}$$

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$$f(x) = x^p - \varepsilon x \quad f\left(\sin \frac{\pi}{p} + i \cos \frac{\pi}{p}\right)$$

(9)

$$\frac{\sqrt{p}}{\sin \frac{\pi}{p} + i \cos \frac{\pi}{p}} = \frac{\sqrt{p} + i}{p} \quad f\left(\frac{\sqrt{p} + i}{p}\right) = p\left(\frac{\sqrt{p} + i}{p}\right)^p - f\left(\frac{\sqrt{p} + i}{p}\right)$$

$$= p\left(\frac{p + i + i\sqrt{p}}{p}\right) - f\left(\frac{\sqrt{p} + i}{p}\right) = \frac{p + i + i\sqrt{p}}{p} + \frac{f\sqrt{p} - 1}{p} = -\frac{1}{p}$$

$$f(x) = \frac{x+1}{x-1} \quad f\left(f\left(\frac{a+1}{a-1}\right)\right) = a \quad \text{DA} = \{R - \{1\}\} \quad a \neq 1 \quad (9)$$

$$f\left(f\left(\frac{a+1}{a-1}\right)\right) = \frac{a+1}{a-1} \times \frac{\frac{a+1}{a-1} + 1}{\frac{a+1}{a-1} - 1} = \frac{a+1}{a-1} \times \frac{\frac{a+1+a-1}{a-1}}{\frac{a+1-a+1}{a-1}} = \frac{a+1}{a-1} \times \frac{2a}{2} = \frac{a+1}{a-1} \times a = a$$

$$f(x) = x^p - \varepsilon x, \quad y(x) = \sqrt{x^p - 1} \quad f(y(a)) = -\varepsilon \quad a) (9)$$

$$(\sqrt{a^p - 1})^p - \varepsilon(\sqrt{a^p - 1}) = -\varepsilon \quad \sqrt{a^p - 1} \quad a = \pm \sqrt{a}$$

$$|a^p - 1| - \varepsilon \sqrt{a^p - 1} = -\varepsilon$$

$$t^p - \varepsilon t + \varepsilon = 0 \quad (t - \sqrt[p]{\varepsilon})^p = 0 \quad t = \sqrt[p]{\varepsilon} \quad (\sqrt{a^p - 1})^p = (\sqrt[p]{\varepsilon})^p \quad |a^p - 1| = \varepsilon$$

$$f(x+p) = x^p - \omega x + 4 \rightarrow f(x) \times f(-p) \quad (9)$$

$$x+p = \varepsilon \quad x=1 \quad (1)^p - \omega(1) + 4 = 1 - \omega + 4 = p \quad x+p = \varepsilon \quad x=1$$

$$x+p = 1-p \quad x=-4 \quad (-4)^p - \omega(-4) + 4 = p4 + p0 + 4 = p4$$

$$p \times p4 = 1 \times p$$

$$f(\sqrt[p]{p} \cos \theta + \omega \cos \theta) = \tan^p \theta \rightarrow f(p/a) \quad (9)$$

$$f \cos^p \theta + \omega \cos \theta = p/a$$

$$-\frac{p}{x} \times \varepsilon = -1 \varepsilon$$

$$(f \cos^p \theta + \omega \cos \theta - p/a) = 0$$

$$\cos^p \theta + \omega \cos \theta - 1 \varepsilon = 0 \quad (\cos \theta - \sqrt[p]{\varepsilon})(\cos \theta + \sqrt[p]{\varepsilon}) = 0 \quad \begin{cases} \cos \theta = +\sqrt[p]{\varepsilon} = 1 \frac{1}{2} \sqrt[p]{\varepsilon} \\ \cos \theta = -\sqrt[p]{\varepsilon} = -1 \frac{1}{2} \sqrt[p]{\varepsilon} \end{cases}$$

$$\cos \theta = \frac{1}{\sqrt[p]{\varepsilon}} \quad \theta = 40^\circ \quad \tan^p 40^\circ = (\sqrt[p]{p})^p = p$$

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