$h: x \to \frac{x}{4-x}$; $f: x \to \ln\frac{x}{4-x}$

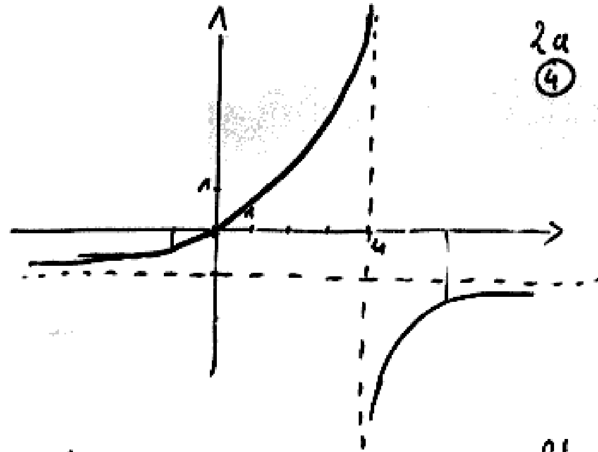
1a ④ $\mathbb{D}_h = \mathbb{R}\setminus\{4\}$; $x^N = 0$

$\lim_{x\to 4\pm} \frac{x^{\nearrow 4}}{4-x} = \mp\infty$; $\lim_{x\to\pm\infty} \frac{x}{4-x} = -1$

1b ④ $h'(x) = \frac{1(4-x)-x(-1)}{(4-x)^2} = \frac{4}{(4-x)^2} > 0$

abschnittsweise str. mo. wa. $-\infty < x < 4$ und von

$4 < x < \infty$



2a ④ $\mathbb{D}_g$ $\frac{x}{4-x} > 0$

a) $x > 0$ u. $4-x > 0$

$x > 0$ u. $4 > x$

$\boxed{0 < x < 4}$

b) $x < 0$ u. $4-x < 0$

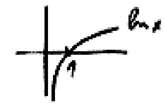
$4 < x$

$\Rightarrow \{\,\}$

$\frac{x}{4-x} = 1$

$x = 4-x \Rightarrow 2x = 4 \Rightarrow x^N = 2$

2b ③ $\lim_{x\to 0+} \ln\left(\underbrace{\frac{x}{4-x}}_{\downarrow\, 0}\right) = -\infty$



$\lim_{x\to 4-} \ln\left(\underbrace{\frac{x}{4-x}}_{\downarrow\, \infty}\right) = \infty$

2c ④ $g' = \frac{1}{\frac{x}{4-x}} \cdot \frac{4}{(4-x)^2}$ $\qquad g = \ln g \Rightarrow g' = \frac{1}{g}\cdot g'$

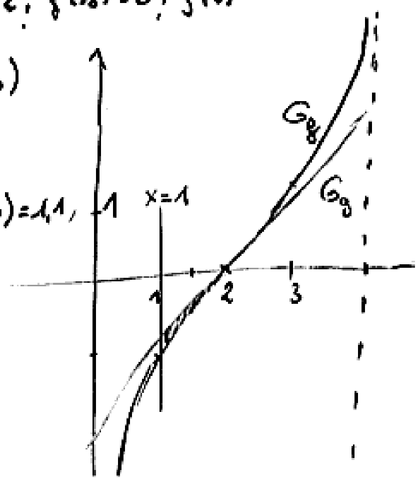
$= \frac{4}{x(4-x)} > 0$

2d ③ $g: x \to x-2$ $\qquad x_0 = 2$; $g(x_0) = 0$; $g'(2) = 1$

$t: y = (x - x_0)\cdot g'(x_0) + g(x_0)$

$y = (x-2)\cdot 1 = x-2$

2e ④ $g(1) = -1{,}1$; $g(1{,}5) = -0{,}5$; $g(3) = 1{,}1$



3a ④ $F: x \to \underbrace{x}_{u}\cdot\underbrace{\ln\frac{x}{4-x}}_{v} + 4\ln(4-x)$

$F' = 1\cdot\ln\frac{x}{4-x} + \cancel{x\frac{4}{x(4-x)}} + \cancel{4\cdot\frac{1}{4-x}\cdot(-1)}$

$F' = g$

3b ⑥ $A = -\frac{1}{2} + \ln\frac{27}{16}$ $\qquad \int_1^2 (g-g)\,dx = F(2) - G(2) - [F(1) - G(1)]$

$g(x) = x-2$

$G(x) = \frac{x^2}{2} - 2x$

$= 2\cdot\underbrace{\ln\frac{2}{2}}_{0} + 4\ln 2 - 2 + 4 - \left[\ln\frac{1}{3} + 4\ln 3 - \frac{1}{2} + 2\right]$

$(n\ln a = \ln a^n)$ $\qquad = \ln 2^4 + \frac{1}{2} - \ln 3^4 - \ln\frac{1}{3}$

$(\ln a - \ln b = \ln\frac{a}{b})$ $\qquad = \ln 16 + \frac{1}{2} - \ln 3^4 + \ln 3$

$(-\ln\frac{a}{b} = \ln\left(\frac{a}{b}\right)^{-1} = \ln\frac{b}{a})$ $\qquad = \frac{1}{2} + \ln 16 + \ln\frac{\cancel{3}}{3^{\cancel{4}3}} = \frac{1}{2} + \ln\frac{16}{27}$