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$g(x) = (2\tan x)(1+\tan^2 x) - \sqrt{2}\sin x\, f'(\tan^2 x + \sqrt{2}\cos x)$ — 1

$g'(\frac{\pi}{4}) = (2\times 2 - 1) f'(1+1) \quad \sqrt{2} = 2f'(2) \quad f'(2) = \frac{\sqrt{2}}{2}$

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$f(x) - 2g(x) = \frac{1+\cos^2 x}{2-\cos^2 x} - \frac{2}{2-\cos x} = \frac{1+\cos^2 x - 1 - 2\cos x}{2-\cos^2 x} = -\cos x$

$f'(x) = 2g'(x) = \sin x \quad f'(\frac{7\pi}{4}) - 2g'(\frac{7\pi}{4}) = \sin\frac{7\pi}{4} = -\frac{1}{2}$

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$x > \frac{3}{2} \rightarrow f(x) = (2x-3)\sqrt{ax} \rightarrow f'(x) = 2\sqrt{ax}\, f'(\frac{3}{2}) = 2\sqrt{\frac{3a}{2}} = \sqrt{6a}$

$x < \frac{3}{2} \rightarrow f(x) = (-2x+3)\sqrt{ax} \rightarrow f'(x) = -2\sqrt{ax}\, f'(\frac{3}{2}) = -\sqrt{\frac{3a}{2}} = -\sqrt{6a}$

$f'_+(\frac{3}{2}) - f'_-(\frac{3}{2}) = 2\sqrt{6a} \quad 2\sqrt{6a} = 2\sqrt{4} \quad 2\sqrt{6a} = \sqrt{4}$

$12a = 4 \quad a = \frac{1}{3}$

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$y = -ax + 2 \quad f(2) = -2a + 2 \quad f'(2) = -a - 2a + 2 - a = -1$

$a = \frac{3}{8} \quad f'(2) = -a = -\frac{3}{8}$

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$7y - x = 8 \rightarrow y = \frac{8+x}{7} \quad \frac{ax-1}{3x+1} = \frac{x+8}{7} \quad 7ax - 7 = 3x^2 + 25x + 8$

$3x^2 + (14 - 7a)x + 15 = 0 \quad a = 0 \rightarrow 3x^2 + 14x^2 - 33x - 15 = 0$

$(7a-2)(7a-28) = 0 \quad \begin{cases} a = \frac{2}{7} \rightarrow 3x^2 + 12x + 15 = 0 \\ a = 4 \rightarrow 3x^2 - 12x + 15 = 0 \end{cases}$

$f(2)=0 \rightarrow 1+2a-b=0 \quad f'(2)=0 \quad f(x)=2x^2+ax$

$12+a=0 \quad a=-12 \rightarrow b=-14 \quad b-a=-14-(-12)=-2$

$x=\frac{\sqrt{y}+1}{\sqrt{y}-1} \quad \sqrt{y}=\frac{x+1}{x-1} \rightarrow y=\left(\frac{x+1}{x-1}\right)^2 \quad y'\left(\frac{x+1}{x-1}\right)\left(\frac{-2}{(x-1)^2}\right)$

$f'(2)=2\times 3\times(-2) \quad =-12$

$f(-1)=-1a+1 \quad f(0)=1 \quad \frac{f(0)-f(-1)}{0-(-1)}=-11$

$1-(-1a+1)=-11 \quad 1a-2=-11 \quad a=-\frac{1}{2}$

$f'(x)=3(x^2+1)^2\times 2x\left(-\frac{1}{2}x+1\right)(x^2+1)^3\left(-\frac{1}{2}\right)$

$f'(1)=(3\times 2\times 2\times\frac{1}{2}\times(1\times-\frac{1}{2})=12-2=1$