Exp) Use linear approximation to estimate $\tan\left(\frac{\pi}{4} + 0.01\right)$

$$\boxed{L(x) = f(a) + f'(a)(x-a)}$$

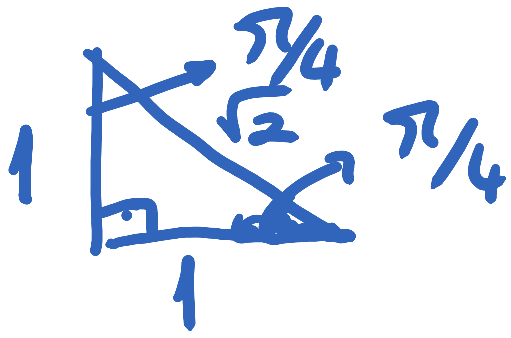
$f(x) = \tan x$ $\qquad\qquad$ $L(x) = 1 + 2\cdot\left(x - \frac{\pi}{4}\right)$

$a = \frac{\pi}{4}$

$f\left(\frac{\pi}{4}\right) = f(a) = \tan\left(\frac{\pi}{4}\right) = 1$

$f'(x) = \sec^2 x$

$f'\left(\frac{\pi}{4}\right) = \sec^2\left(\frac{\pi}{4}\right) = \frac{1}{\cos^2\left(\frac{\pi}{4}\right)} = \frac{1}{\left(\frac{1}{\sqrt{2}}\right)^2} = \frac{1}{\frac{1}{2}} = 2$



$\cos\theta = \cos\left(\frac{\pi}{4}\right) = \frac{A}{H} = \frac{1}{\sqrt{2}}$

$\cos^2\left(\frac{\pi}{4}\right) \neq \cos\left(\frac{\pi}{4}\right)^2$

$L(x) = 1 + 2\left(x - \frac{\pi}{4}\right)$

$L\left(\frac{\pi}{4} + 0.01\right) = 1 + 2\left(\cancel{\frac{\pi}{4}} + 0.01 - \cancel{\frac{\pi}{4}}\right)$

$= 1 + 2(0.01)$

$= 1 + 0.02$

$= \boxed{1.02}$