(22) $\lim\limits_{x \to 0} \frac{\operatorname{arctg} x}{x} = \text{„}\frac{0}{0}\text{"} =$ | $t = \operatorname{arctg} x$

$\operatorname{tg} t = x$

$x \to 0 \Rightarrow t \to \operatorname{arctg} 0 = 0$

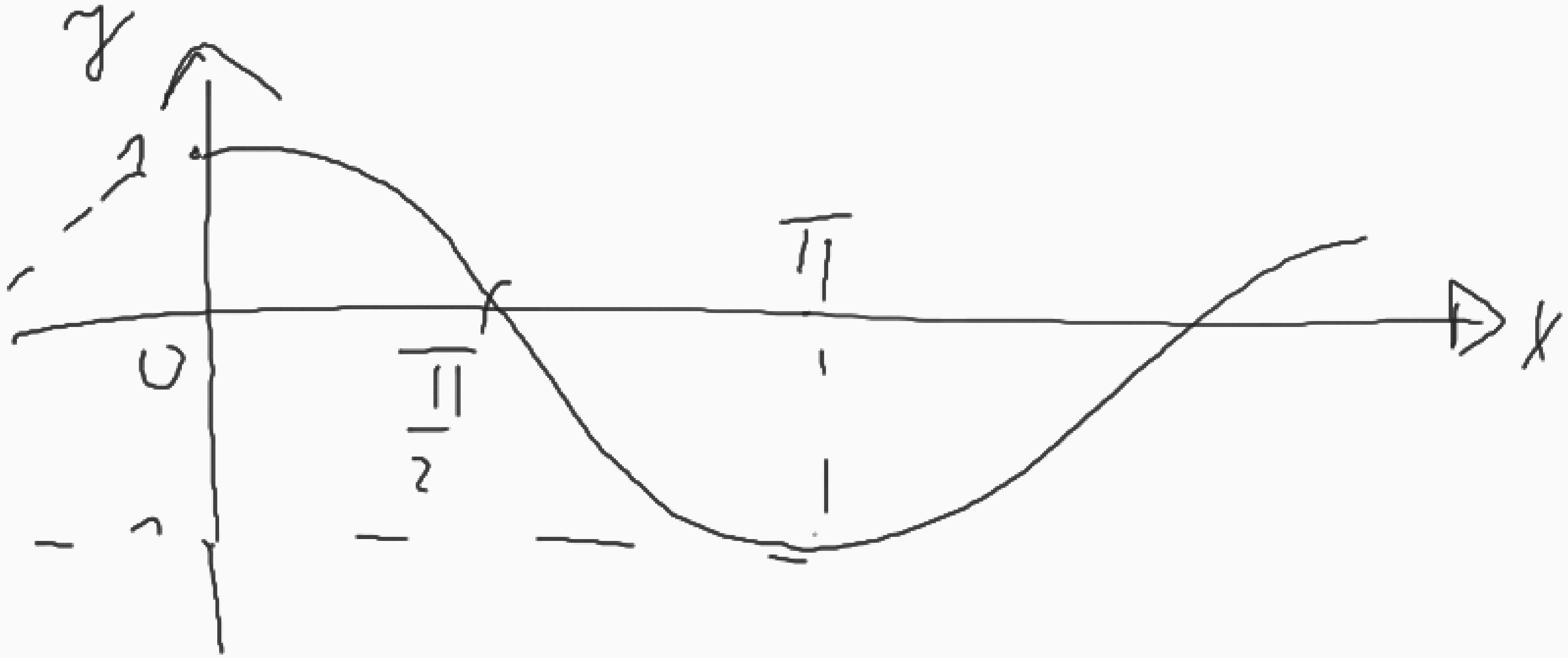
$= \lim\limits_{t \to 0} \frac{t}{\operatorname{tg} t} = \lim\limits_{t \to 0} \frac{t}{\frac{\sin t}{\cos t}} = \lim\limits_{t \to 0} \cos t \cdot \frac{t}{\sin t}$

$= \lim\limits_{t \to 0} \cos t \cdot \lim\limits_{t \to 0} \frac{1}{\frac{\sin t}{t}} = 1 \cdot \frac{1}{1} = \underline{\underline{1}}$

$= 1$

(23) $\lim\limits_{x \to \pi} \dfrac{\operatorname{tg} x}{\sin 2x} = "\dfrac{0}{0}" = \lim\limits_{x \to \pi} \dfrac{\dfrac{\sin x}{\cos x}}{\dfrac{2 \sin x \cdot \cos x}{1}} =$

$= \lim\limits_{x \to \pi} \dfrac{\cancel{\sin x}\ 1}{2\cancel{\sin x} \cos^2 x} = \dfrac{1}{2 \cdot (-1)^2} = \underline{\underline{\dfrac{1}{2}}}$



(24)
$$\lim_{x\to 2}\frac{\arcsin(x-2)}{\underbrace{x^2-2x}_{4-4=0}} \overset{\text{"}\frac{0}{0}\text{"}}{=} \lim_{x\to 2}\frac{\arcsin(x-2)}{\underbrace{x}_{2}(x-2)}$$

$$= \frac{1}{2}\lim_{x\to 2}\frac{\arcsin(x-2)}{x-2} :$$

$t = \arcsin(x-2)$

$\sin t = x-2$

$x \to 2 \Rightarrow t \to \arcsin(2-2) = \arcsin 0 = 0$

$$= \frac{1}{2}\lim_{t\to 0}\frac{t}{\sin t} = \frac{1}{2}\lim_{t\to 0}\frac{1}{\underbrace{\frac{\sin t}{t}}_{=1}} = \frac{1}{2}$$

(25) $$\lim_{x \to 0} \frac{1-\cos(2x)}{x^2} = \text{"}\frac{0}{0}\text{"} =$$

$$= \lim_{x \to 0} \frac{\overbrace{\sin^2 x + \cancel{\cos^2 x} - (\cancel{\cos^2 x} - \sin^2 x)}^{2\sin^2 x}}{x^2} =$$

$$= 2 \lim_{x \to 0} \frac{\sin^2 x}{x^2} = 2 \underbrace{\lim_{x \to 0} \frac{\sin x}{x}}_{=1} \cdot \underbrace{\lim_{x \to 0} \frac{\sin x}{x}}_{=1} =$$

$$= 2 \cdot 1 \cdot 1 = \underline{\underline{2}}$$

(26)

$$\lim_{x \to \frac{\pi}{4}} \frac{\cos(2x)}{\cos x - \sin x} = \text{"}\frac{0}{0}\text{"} = \lim_{x \to \frac{\pi}{4}} \frac{\cos^2 x - \sin^2 x}{\cos x - \sin x} = \lim_{x \to \frac{\pi}{4}} \frac{\cancel{(\cos x - \sin x)}(\cos x + \sin x)}{\cancel{\cos x - \sin x}} = \frac{\sqrt{2}}{2} + \frac{\sqrt{2}}{2} = \underline{\underline{\sqrt{2}}}$$

(27) $\lim\limits_{x \to 0} \frac{\sin(4x)}{\sqrt{x+1}-1} \cdot \frac{\sqrt{x+1}+1}{\sqrt{x+1}+1} =$

$= \lim\limits_{x \to 0} \frac{\sin(4x) \cdot (\sqrt{x+1}+1)}{x+\cancel{1}-\cancel{1}} =$

$= \sqrt{1}+1 = 1+1 = 2$

$= 2 \underbrace{\lim\limits_{x \to 0} \frac{\sin(4x)}{4x}}_{1} \cdot 4 = \underline{\underline{8}}$

(28) $$\lim_{x\to\infty} \underbrace{e^x}_{e^\infty=\infty}\underbrace{(2+\underbrace{\cos x}_{\langle -1,1\rangle})}_{1\le x\le 3} = \text{"}\infty\text{"}$$

$\Downarrow$

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"0"

(29)

$$\lim_{x\to\infty} x\left(\ln(x+2)-\ln x\right) =$$

$$= \lim_{x\to\infty} x \ln\left(\frac{x+2}{x}\right) = \lim_{x\to\infty} \ln\left(\frac{x+2}{x}\right)^{x}$$

$$= \ln \underbrace{\boxed{\lim_{x\to\infty}\left(1+\frac{2}{x}\right)^{x}}}_{e^{2}} = \ln e^{2} =$$

$$= 2\ln e = \underline{\underline{2}}$$

(30) $\lim_{x \to 0} \left(1 + 3\,tg^2(x)\right)^{cotg^2(x)} = \left| \begin{array}{l} t = tg^2 x \\ \frac{1}{t} = cotg^2 x \\ x \to 0 \Rightarrow t \to 0 \end{array} \right|$

$$\boxed{\lim_{t \to 0} (1 + 1t)^{\frac{1}{t}} = e^{1} \qquad \Delta = \frac{1}{t}}$$

$$= \underbrace{\lim_{t \to 0} (1 + 3t)^{\frac{1}{t}}}_{} = e^3$$