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Exercise 1. Determine the value of the following limits in $\overline{\mathbb{R}}$; if a limit does not exist, cross out the equal sign and write "DNE." No justifications required.
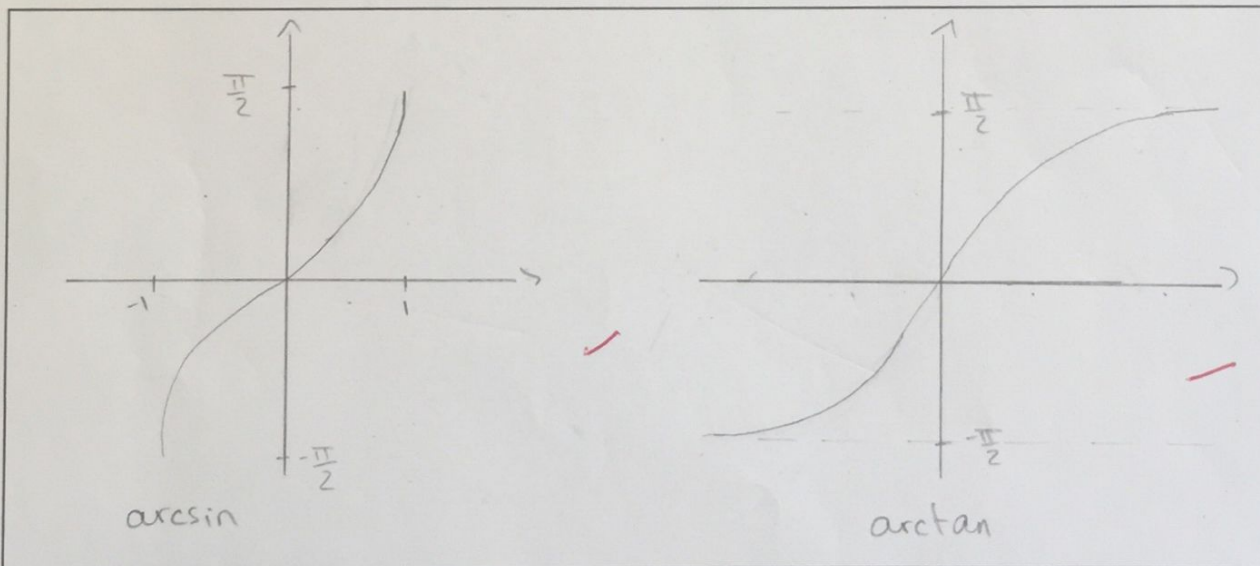
$$\lim_{X \to 1} \frac{\ln(X)}{X - 1} = 1$$

$$\lim_{x \to 0} \frac{\sin(x)}{x} = 1$$

$$\lim_{x \to 0} x \frac{\ln\left(\frac{\sin(x)}{x}\right)}{\sin(x) - x} = 1$$

$$\lim_{x \to +\infty} e^x - x\cos(x) = +\infty$$

Exercise 2.

1. Fill in the blanks with the appropriate domain and *range*. No justifications required.

arcsin : $[-1,1] \longrightarrow [-\frac{\pi}{2}, \frac{\pi}{2}]$

arctan : $\mathbb{R} \longrightarrow (-\frac{\pi}{2}, \frac{\pi}{2})$

2. Sketch the graph of arcsin and arctan:

arcsin

arctan

Exercise 3. Fill in the blanks with the appropriate values. No justifications required.

$\arcsin(1/2) = \dfrac{\pi}{6}$

$\forall x \in [-1,1]$, $\arcsin(x) + \arccos(x) = \dfrac{\pi}{2}$

$\forall x \in [-1,1]$, $\sin(\arccos(x)) = \sqrt{1-x^2}$