Simplify Trig Expressions

A Level

P P P

Pre-Uni Maths for Sciences H3.1

Simplify the following trigonometric expressions.

Part A $\frac{1}{\cos^2 t - 1}$

Simplify the following expression to give a single trigonometric function:

$$\frac{1}{\cos^2 t - 1}$$

The following symbols may be useful: `cos()`, `cosec()`, `cot()`, `sec()`, `sin()`, `t`, `tan()`

Part B $\frac{1-\sin^2 x}{\cos x}$

Simplify the following expression to give a single trigonometric function:

$$\frac{1 - \sin^2 x}{\cos x}$$

The following symbols may be useful: `cos()`, `cosec()`, `cot()`, `sec()`, `sin()`, `tan()`, `x`

Part C $\sin\alpha\tan\alpha - \frac{1}{\cos\alpha}$

Simplify the following expression to give a single trigonometric function:

$$\sin\alpha\tan\alpha - \frac{1}{\cos\alpha}$$

The following symbols may be useful: `alpha, cos(), cosec(), cot(), sec(), sin(), tan()`

Part D $\tan w - \frac{\cos w}{1-\sin w}$

Simplify the following expression to give a single trigonometric function:

$$\tan w - \frac{\cos w}{1-\sin w}$$

The following symbols may be useful: `cos(), cosec(), cot(), sec(), sin(), tan(), w`

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Functions: Reciprocal Trig 1ii

A Level

P P P

Part A $\sec\frac{1}{2}\alpha = 4$

Solve, for $0° < \alpha < 180°$, the equation $\sec\frac{1}{2}\alpha = 4$. Give your answer in degrees, to three significant figures.

Part B $\tan\beta = 7\cot\beta$

Solve, for $0° < \beta < 180°$, the equation $\tan\beta = 7\cot\beta$. Give your answers to three significant figures.

Enter your answers in order from lowest value of β to highest.

_____ (lowest value)

_____ (highest value)

Gameboard:

STEM SMART Single Maths 30 - Trigonometry: Reciprocal & Inverse Functions

Advanced Trig Identities 5ii

A Level

Solve, for $0° < \theta < 360°$, the equation $\sec^2\theta = 4\tan\theta - 2$. Give inexact answers to 1 dp.

Enter your answers in order from lowest value of θ to highest.

(lowest value)

(highest value)

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Advanced Trig Identities 2ii

A Level

P P P

Part A $2\tan^2\theta - \frac{1}{\cos\theta}$

Express $2\tan^2\theta - \frac{1}{\cos\theta}$ in terms of $\sec\theta$.

The following symbols may be useful: `sec(), theta`

Part B **Solve**

Hence solve, for $0^\circ < \theta < 360^\circ$, the equation

$$2\tan^2\theta - \frac{1}{\cos\theta} = 4$$

Enter your answers in order from lowest value of θ to highest. Give inexact answers to 1 dp.

(lowest value)

(highest value)

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Functions: Inverse Trig 3ii

A Level

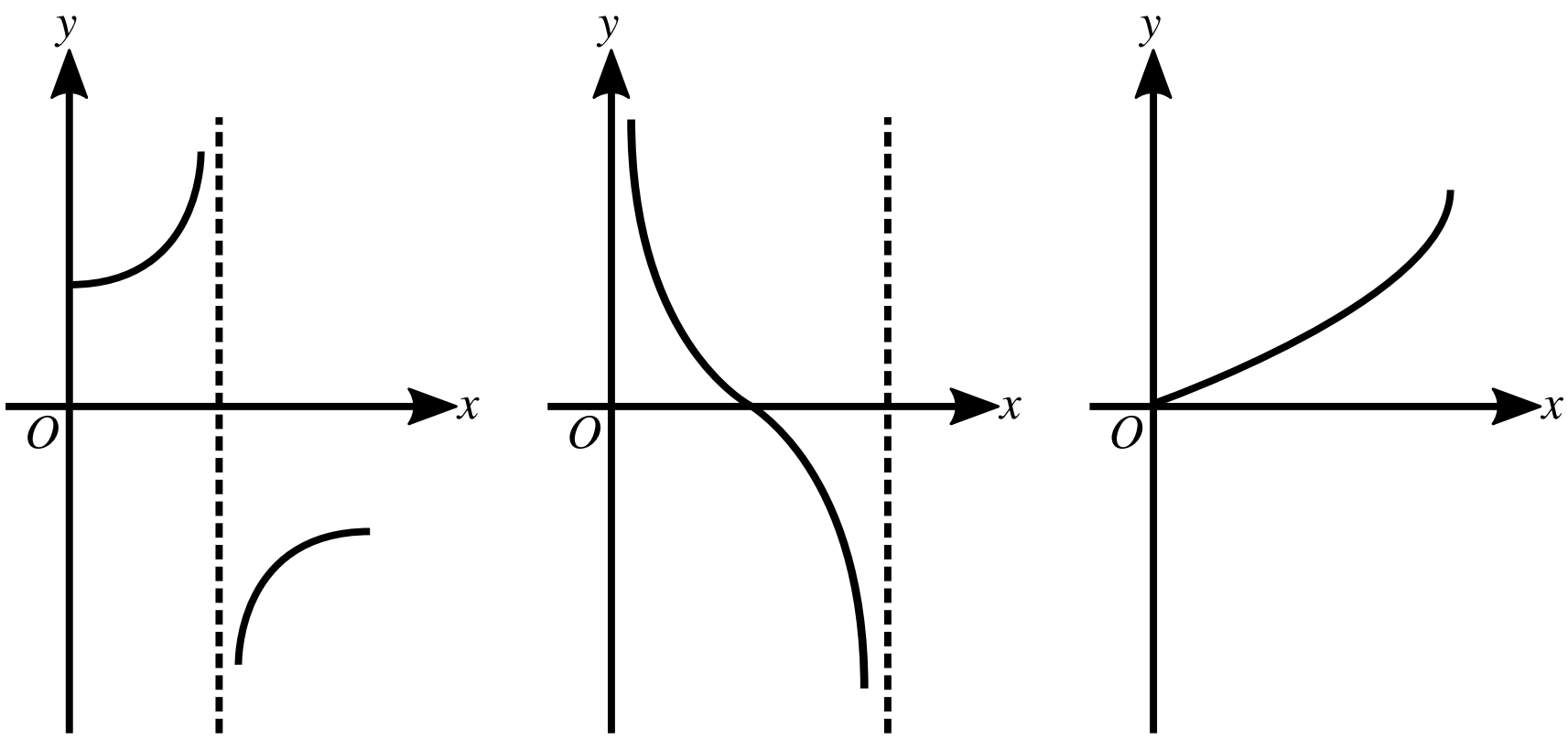

Fig. 1 **Fig. 2** **Fig. 3**

Figure 1: A diagram showing sections of curves

Each diagram in **Figure 1** shows part of a curve, the equation of which is one of the following:

$$y = \sin^{-1} x, \quad y = \cos^{-1} x, \quad y = \tan^{-1} x, \quad y = \sec x, \quad y = \operatorname{cosec} x, \quad y = \cot x$$

Part A

Fig. 1

Which equation corresponds to **Fig. 1**?

- $y = \operatorname{cosec} x$
- $y = \sin^{-1} x$
- $y = \tan^{-1} x$
- $y = \cot x$
- $y = \cos^{-1} x$
- $y = \sec x$

Part B

Fig. 2

Which equation corresponds to **Fig. 2**?

- $y = \cot x$
- $y = \cos^{-1} x$
- $y = \operatorname{cosec} x$
- $y = \tan^{-1} x$
- $y = \sin^{-1} x$
- $y = \sec x$

Part C **Fig. 3**

Which equation corresponds to **Fig. 3**?

- $y = \sin^{-1} x$
- $y = \cos^{-1} x$
- $y = \tan^{-1} x$
- $y = \operatorname{cosec} x$
- $y = \sec x$
- $y = \cot x$

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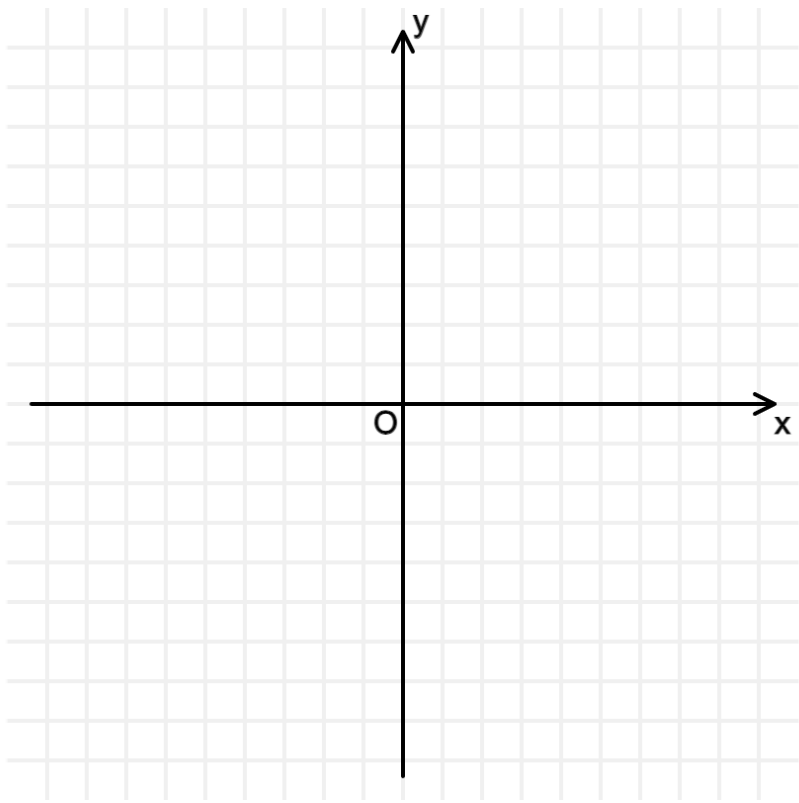
Sketching Reciprocal Trigonometric Functions

A Level

P P P

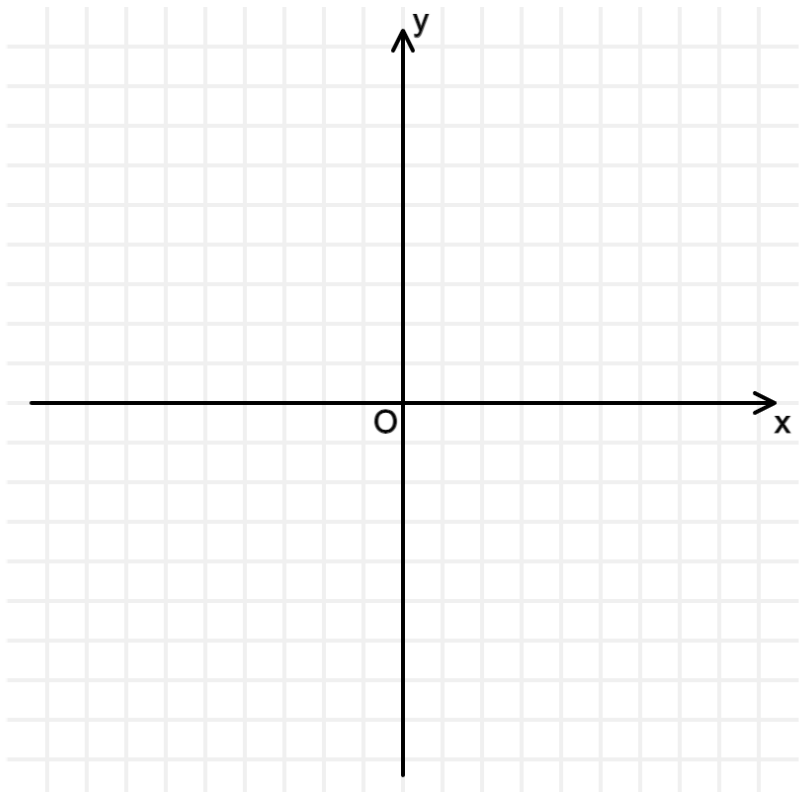
Part A Sketch $2\sec x + 2$

Sketch the graph of $y = 2\sec x + 2$ in the interval $0° \leq x \leq 360°$.



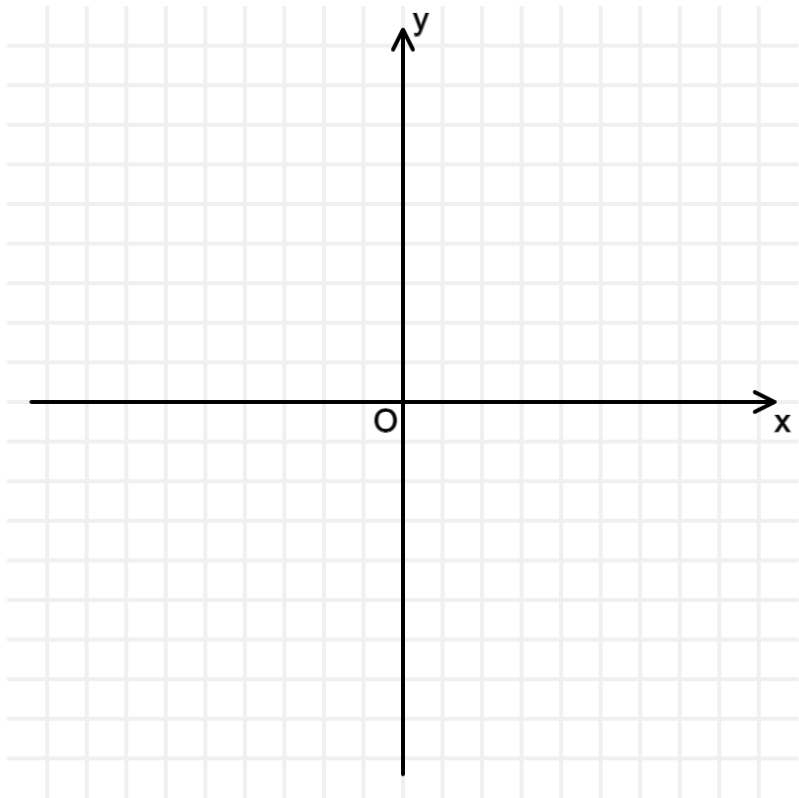
Part B **Sketch** $\cot\left(x+\frac{\pi}{4}\right)-1$

Sketch the graph of $y=\cot\left(x+\frac{\pi}{4}\right)-1$ in the interval $0\leq x\leq 2\pi$.



Part C **Sketch** $-\operatorname{cosec}\frac{x}{2}-3$

Sketch the graph of $y=-\operatorname{cosec}\frac{x}{2}-3$ in the interval $-2\pi\leq x\leq 2\pi$.



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Functions: Inverse Trig 1ii

A Level

Figure 1 shows the graph of $y = -\arcsin(x-1)$.

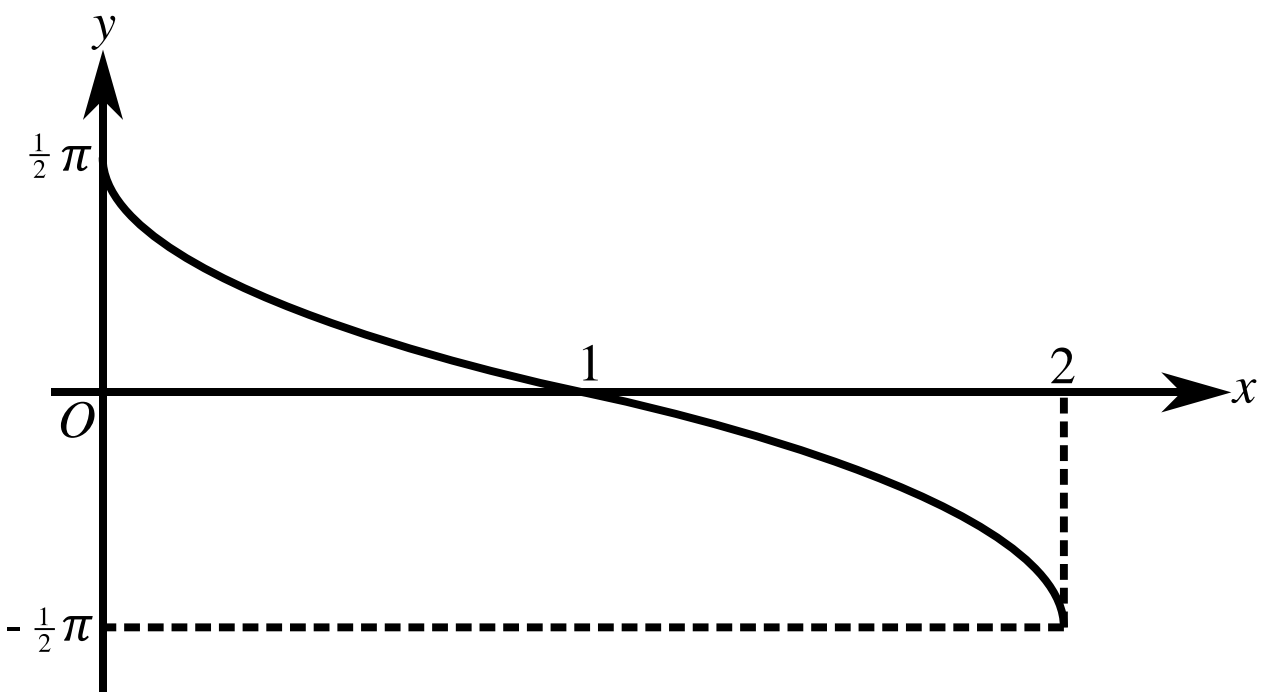

Figure 1: A graph of the function $y = -\arcsin(x-1)$

Part A Transformations

Give details of the pair of geometrical transformations which transform the graph of $y = -\arcsin(x-1)$ to the graph of $y = \arcsin x$.

- Reflect in x-axis, translate by 1 in $-x$-direction
- Reflect in x-axis, translate by 1 in $+x$-direction
- Reflect in y-axis, translate by 1 in $-x$-direction
- Reflect in $y = -x$, translate by 1 in $+x$-direction
- Reflect in y-axis, translate by 1 in $+y$-direction
- Reflect in line $y = x$, translate by 1 in $+y$-direction
- Reflect in y-axis, translate by 1 in $-y$-direction

Part B Sketch

Sketch the graph of $y = \left| -\arcsin(x-1) \right|$.

To see an example sketch, answer the following question: For what value of y does the curve meet the y-axis?

The following symbols may be useful: `pi`

Part C Solutions

Find the exact solutions of the equation $\left| -\arcsin(x-1) \right| = \frac{\pi}{3}$.

Give the largest exact solution.

The following symbols may be useful: x

Give the smallest exact solution.

The following symbols may be useful: x

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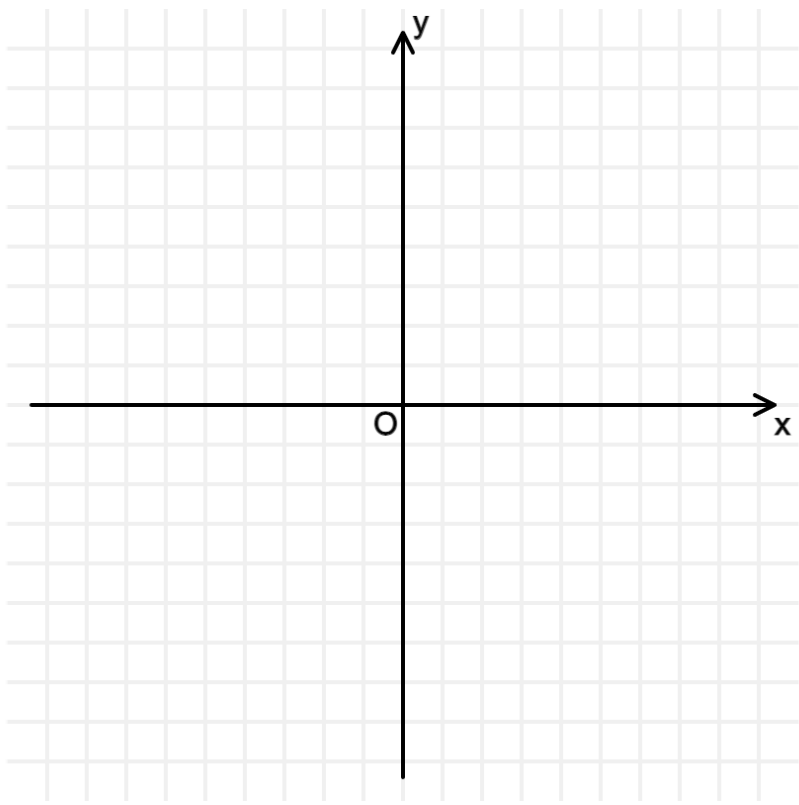
Sketching Inverse Trigonometric Functions

A Level

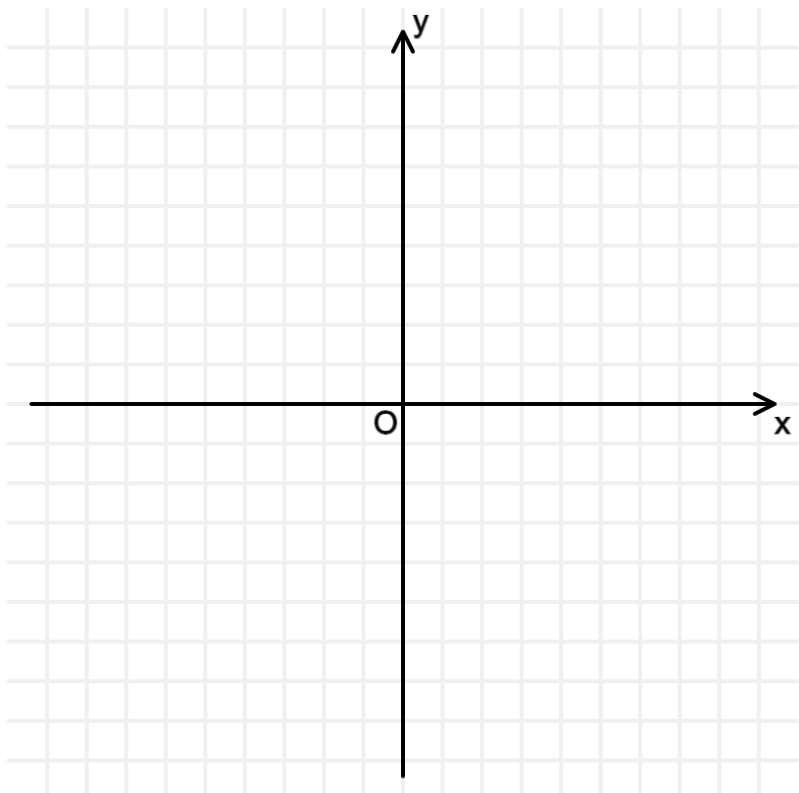
Part A Sketch $\arcsin \frac{x}{3} + \frac{\pi}{2}$

Sketch the graph of $y = \arcsin \frac{x}{3} + \frac{\pi}{2}$.



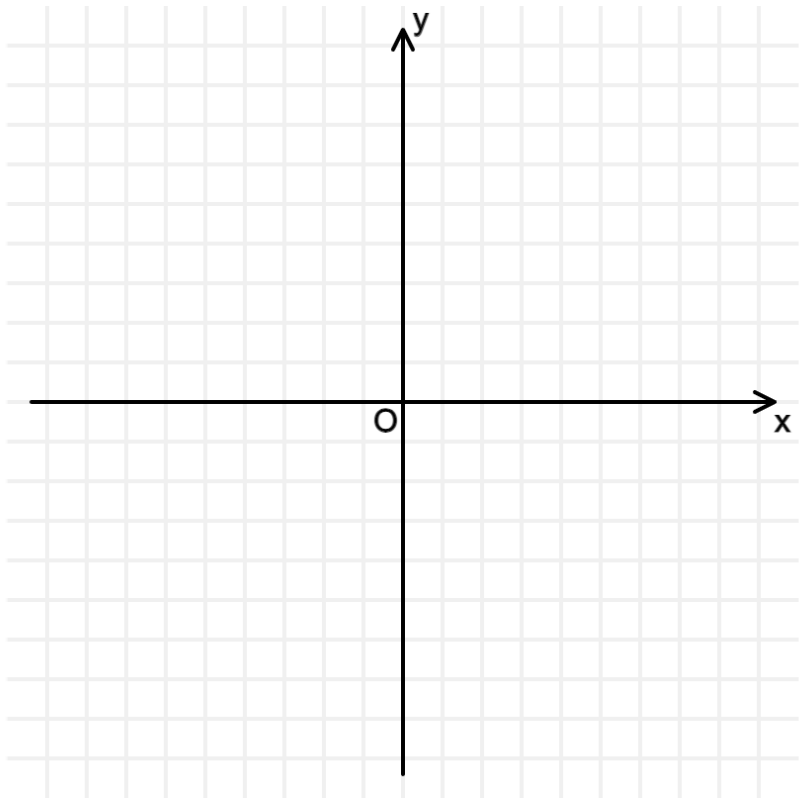
Part B **Sketch** $2\arctan(x-1)$

Sketch the graph of $y = 2\arctan(x-1)$.



Part C **Sketch** $\arccos\left(-\frac{x}{2}+\frac{1}{2}\right)-\frac{\pi}{3}$

Sketch the graph of $y = \arccos\left(-\frac{x}{2}+\frac{1}{2}\right)-\frac{\pi}{3}$.



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