Exercise 20 p161

2) $\frac{\sin x}{2} = 0,112 \qquad x \in [-360°; 360°]$

$\sin x = 0,224$

ref. $\angle = 12,944...$

I	II
$x = 12,94° + k \cdot 360°$	$x = 180° - 12,94° + k \cdot 360°$ $= 167,06° + k \cdot 360°$

$k \in \mathbb{Z}$

$x \in \{-347,06; 12,94; 372,94; -192,94; 167,06\}$

7) $4\tan(2x - 40°) + 13 = 3$

$\frac{4\tan(2x-40°)}{4} = \frac{3-13}{4}$

$\tan(2x - 40°) = \frac{-10}{4}$

$\tan(2x - 40°) = -\frac{5}{2}$

ref. $\angle = \tan^{-1}\left(\frac{5}{2}\right) = 68,19859...$

II	IV
$2x - 40° = 180° - 68,19859... + k \cdot 180°$ $2x = 151,80° + k \cdot 180°$ $x = 75,9° + k \cdot 90°$	$2x - 40° = 360° - 68,198... + k \cdot 180°$ $2x = 331,801... + k \cdot 180°$ $x = 165,9° + k \cdot 90°$

$k \in \mathbb{Z}$

8) $\cos(x-12^\circ) = \sin 56^\circ \qquad x \in [0^\circ; 360^\circ]$

$\cos(x-12^\circ) = \cos(90^\circ - 34^\circ)$

I	IV
$x - 12^\circ = 90^\circ - 34^\circ + K \cdot 360^\circ$	$x - 12^\circ = 360^\circ - (90^\circ - 34^\circ) + K \cdot 360^\circ$
$x = 68^\circ + K \cdot 360^\circ$	$x = 316^\circ + K \cdot 360^\circ$

$K \in \mathbb{Z}$

$x \in \{68^\circ; 316^\circ\}$

10) $4\cos^2 x \sin x - 3\sin x = 0$

$\sin x (4\cos^2 x - 3) = 0$

$\sin x = 0$ or $\cos^2 x = \frac{3}{4}$

ref. $\angle = 0^\circ$ $\qquad \cos x = \sqrt{\frac{3}{4}}$

$\therefore x = 0^\circ + K \cdot 180^\circ$ $\qquad \cos x = \frac{\sqrt{3}}{2}$

ref. $= 30^\circ$

I	IV
$x = 30^\circ + K \cdot 360^\circ$	$x = 360^\circ - 30^\circ + K \cdot 360^\circ$
	$x = 330^\circ + K \cdot 360^\circ$

$K \in \mathbb{Z}$

13) $\cos(2x+20^\circ) = \cos(30^\circ - x)$

I	IV
$2x + 20^\circ = 30^\circ - x + K \cdot 360^\circ$	$2x + 20^\circ = 360^\circ - (30^\circ - x) + K \cdot 360^\circ$
$\frac{3x}{3} = \frac{10^\circ}{3} + \frac{K \cdot 360^\circ}{3}$	$2x + 20^\circ = 360^\circ - 30^\circ + x + K \cdot 360^\circ$
	$x = 310^\circ + K \cdot 360^\circ$

$x = 3,\dot{3}^\circ + K \cdot 120^\circ$

$K \in \mathbb{Z}$

Finding the values for which the identity is invalid/undefined

- An identity is undefined when the denominator is equal to 0.
- If an identity is underneath a square root, the values under the root cannot be negative.
- If the identity includes $\tan x$, then it is undefined for $x = 90° + K \cdot 180°$

Example 1:

For which values of x is $\dfrac{\tan x + \sin x}{1 + \frac{1}{\cos x}} = \sin x$ undefined?

Undefined when $\tan x$ is undefined

$\therefore x = 90° + K \cdot 180°$ (asymptotes)

Or when the denominator $= 0$

$\therefore 1 + \dfrac{1}{\cos x} = 0$

$\therefore \dfrac{\cos x + 1}{\cos x} = 0$

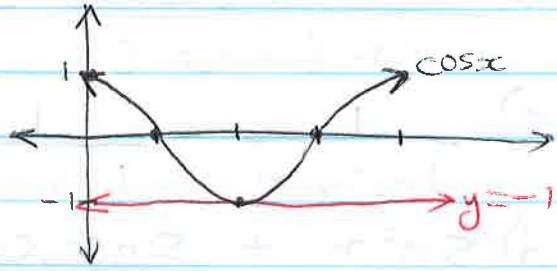
$\cos x + 1 = 0$

$\cos x = -1$

$\therefore x = 180° + K \cdot 360°$

$K \in \mathbb{Z}$

Think:



Example 2:

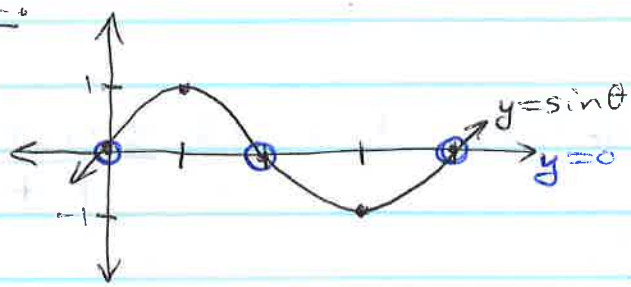
For which values of θ will the following identity be undefined?

$$\frac{\tan\theta \cdot \cos\theta}{\sin\theta} = 1$$

Undefined for $\theta = 90° + k \cdot 180°$
(when $\tan\theta$ is undefined)

Or when $\sin\theta = 0$ (denominator $= 0$)

Think:



$\therefore \theta = 0° + k \cdot 180°$ $\quad k \in \mathbb{Z}$

HW Questions:

1) For which values will the following identities be undefined? State the general solution.

a) $\cos\theta(1+\tan\theta) = \cos\theta + \sin\theta$

b) $\dfrac{1+2\sin\theta\cos\theta}{\sin\theta+\cos\theta} = \sin\theta + \cos\theta$

c) $\dfrac{1}{1-\sin x} - \dfrac{1}{1+\sin x} = \dfrac{2\tan x}{\cos x}$

d) $\sin^2 x + \dfrac{\sin x \cdot \cos x}{\tan x} = 1$