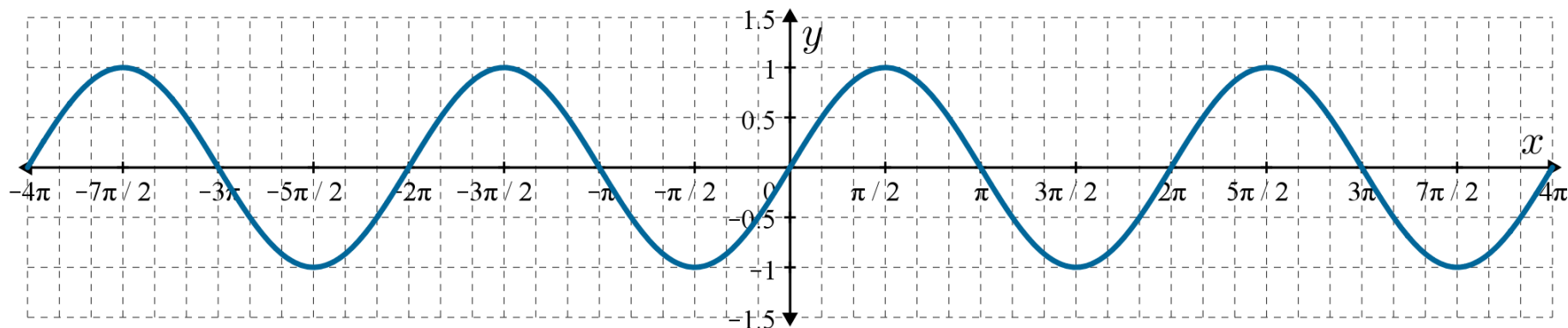


THE GRAPHS OF $y = \sin x$, $y = \cos x$ AND $y = \tan x$

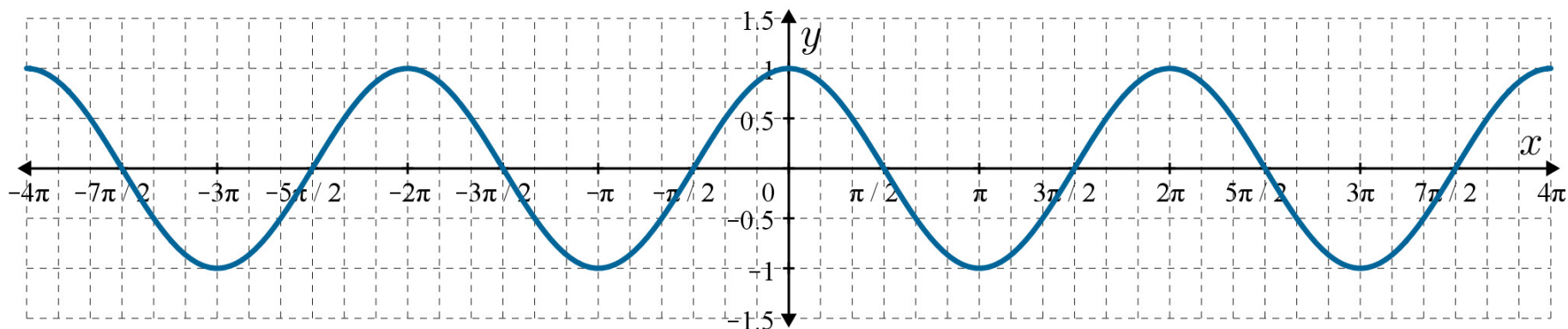
Use the following axes to sketch the graphs of $y = \sin x$ and $y = \cos x$ using **radians** on the x -axis.

- Use increments of $\frac{\pi}{6}$ on the x -axis (you do not need to label every “tick”, but be sure to label all multiples of $\frac{\pi}{2}$).
- Use increments of 0.5 on the y -axis.
- Remember that these graphs continue to the left and right.

$y = \sin x$

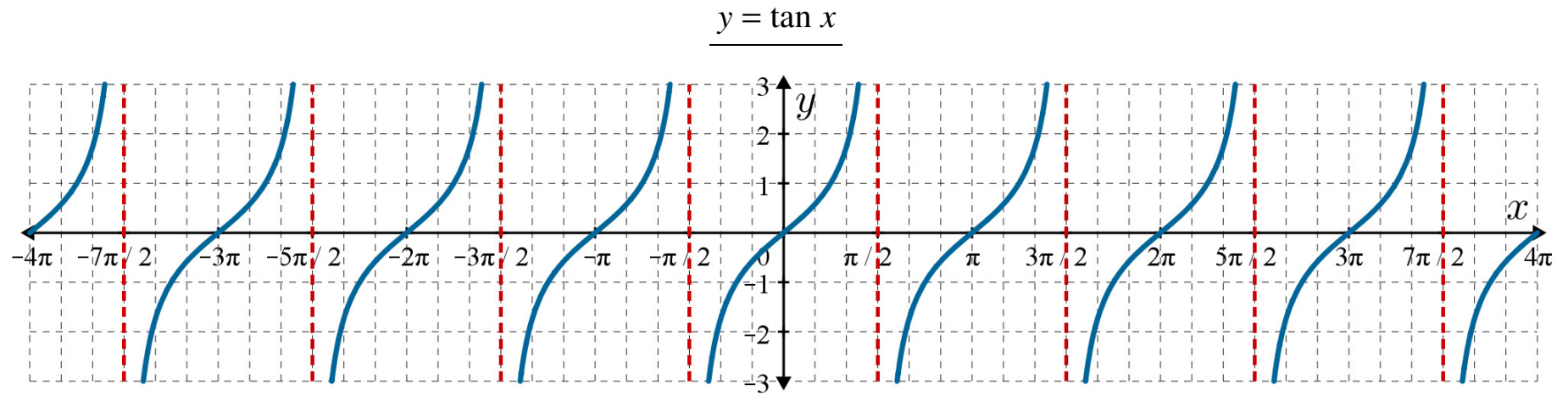


$y = \cos x$



Use the following axes to sketch the graph of $y = \tan x$ using **radians** on the x -axis.

- Use increments of $\frac{\pi}{6}$ on the x -axis (you do not need to label every “tick”, but be sure to label all multiples of $\frac{\pi}{2}$).
- Use increments of 1 on the y -axis.
- Remember that this graph continues to the left and right.



Use your graphs to find the exact value of each of the following.

a) $\sin \frac{\pi}{2} = 1$

b) $\cos 0 = 1$

c) $\tan \pi = 0$

d) $\cos(-\pi) = -1$

e) $\sin 0 = 0$

f) $\sin \frac{11\pi}{2} = -1$

g) $\cos \left(\frac{13\pi}{2} \right) = 0$

h) $\sin(-6\pi) = 0$

i) $\tan \left(-\frac{9\pi}{2} \right) = \text{undefined}$

The Analysis

The Properties of $y = \sin x$

Domain: $\{x \in \mathbb{R}\}$

Range: $\{y \in \mathbb{R} \mid -1 \leq y \leq 1\}$

Period: 2π

Absolute Maximum Value: 1

Absolute Minimum Value: -1

Local Maximum Values: 1

Local Minimum Values: -1

x -intercepts: $\pi k, k \in \mathbb{Z}$

y -intercept: 0

Asymptotes: None

The Properties of $y = \cos x$

Domain: $\{x \in \mathbb{R}\}$

Range: $\{y \in \mathbb{R} \mid -1 \leq y \leq 1\}$

Period: 2π

Absolute Maximum Value: 1

Absolute Minimum Value: -1

Local Maximum Values: 1

Local Minimum Values: -1

x -intercepts: $\frac{\pi}{2} + \pi k, k \in \mathbb{Z}$

y -intercept: 1

Asymptotes: None

The Properties of $y = \tan x$

Domain: $\left\{x \in \mathbb{R} \mid x \neq \frac{\pi}{2} + \pi k, k \in \mathbb{Z}\right\}$

Range: $\{y \in \mathbb{R}\}$

Period: π

Absolute Maximum Value: None

Absolute Minimum Value: None

Local Maximum Values: None

Local Minimum Values: None

x -intercepts: $\pi k, k \in \mathbb{Z}$

y -intercept: 0

Asymptotes: $x = \frac{\pi}{2} + \pi k, k \in \mathbb{Z}$