Session 04-04 - Tasks

Introduction to Trigonometric Functions

Trigonometric Functions - Problem Set

Problem 1: Angle Conversion (x)

Convert between degrees and radians:

a) Convert 225° to radians

b) Convert $7\pi/6$ radians to degrees

c) Convert –120° to radians

d) Convert $3\pi/4$ radians to degrees

Problem 2: Exact Trigonometric Values (x)

Find the exact values without a calculator:

a) $\sin(\pi/6)$

b) $\cos(\pi/3)$

c) $\tan(\pi/4)$

d) $\sin(3\pi/2)$

Problem 3: Unit Circle Coordinates (xx)

Find the exact coordinates ($\cos \boldsymbol{\theta}$, $\sin \boldsymbol{\theta}$) on the unit circle for:

a) $\theta = 2\pi/3$

b) $\theta = 5\pi/4$

c) $\theta = 11\pi/6$

d) $\theta = 4\pi/3$

Problem 4: Analyzing Trigonometric Functions (xx)

For each function, find the amplitude, period, and range:

a) $y = 2\sin(x)$

b) $y = \cos(3x)$

c) $y = -3\sin(x/2)$

d) $y = 4\cos(2x) + 1$

Problem 5: Graphing Transformations (xx)

Sketch one period of each function and identify key features:

a) $y = \sin(x - \pi/4)$

b) $y = 2\cos(x) - 1$

c) $y = \sin(2x)$

d) $y = -\cos(x + \pi/2)$

Problem 6: Ferris Wheel Application (xxx)

A Ferris wheel has a radius of 15 meters and its center is 18 meters above ground. It completes one rotation every 3 minutes, starting with a rider at the bottom.

a) Write a function h(t) for the height of a rider at time t minutes

b) What is the rider's height after 45 seconds?

c) What is the rider's height after 1 minute? After 1.5 minutes?

d) What is the maximum and minimum height?

Problem 7: Temperature Modeling (xxxx)

The daily temperature in a city can be modeled by:

$$T(h) = 20 + 8\sin\left(\frac{\pi}{12}(h - 6)\right)$$

where T is temperature in °C and h is the hour of the day ($0 \leq h \leq 24$).

a) What is the period of this function? What does this represent?

b) At what time does the maximum temperature occur? What is the maximum temperature?

c) At what time does the minimum temperature occur? What is the minimum temperature?

d) Find the temperature at 9:00 AM, noon, 3:00 PM, and 9:00 PM.