Below you will find 10 problems, each worth 10 points. Solve the problems in the space provided. When writing a solution to a problem, show all work. No books or notes are allowed. Sign and submit your formula sheet with the exam.

**Problem 1.** A rocket, flying on a straight vertical trajectory, is observed from a point positioned 1000 meters away from the launch site. During the final minute of flight, the angle of elevation of the rocket (measured from the observation point) changed from $64^\circ$ to $78^\circ$. How long was the flight path of the rocket during this period? Approximate your answer to the nearest tenth of a meter.
Problem 2. The graph of the equation \( y = a \sin(bx + c) \), with \( a > 0 \) and \( b > 0 \), is shown in the figure below.

(a) Find the amplitude and the period.

(b) Find the coefficients \( a \), \( b \) and \( c \).

Problem 3. Find the amplitude and the period for the curve \( y = 4 \sin\left(2x + \frac{\pi}{3}\right) \).

Problem 4. Verify the identity: \( (\csc \theta - \cot \theta)(1 + \sec \theta) = \tan \theta \).
Problem 5. Find all solutions of the equation: \( \sin \left( 4x + \frac{\pi}{3} \right) = \frac{1}{2} \). Use exact values.

Problem 6. Find the exact values of \( \sin \left( \frac{23\pi}{3} \right) \) and \( \cos \left( \frac{23\pi}{3} \right) \).

Problem 7. Find the solutions of the equation \( 4\cos^2 t - 4\cos t - 3 = 0 \), that are in the interval \([0, 2\pi)\). Use exact values.
Problem 8. Verify the identity: \( \cos x + \sin x \tan x = \sec x \).

Problem 9. Given the triangle \( \triangle ABC \), with \( \hat{C} = 90^\circ \), \( a = 3 \) cm, and \( b = 2 \) cm, find the remaining elements of the triangle: the side \( c \), and the angles \( \hat{A} \) and \( \hat{B} \). (When computing the angles, express them in degrees, rounded to the nearest tenth.)

Problem 10. Find the solutions of the equation \( \tan^2 x - 2 \tan t - 4 = 0 \), that are in the interval \( \left(-\frac{\pi}{2}, \frac{\pi}{2}\right) \). Round to nearest tenth of a radian.