You must show all of your work for credit.

Problem 1: An old rock formation is warped into the shape of a sinusoid. Over the centuries, the top has eroded away, leaving the ground with a flat surface from which various layers of rock are cropping out (see the figure below). Since you have studied sinusoids, the geologists call upon you to predict the depth of a particular formation at various points. You construct an x-axis along the ground and a y-axis at the edge of an outcropping, as shown. A hole drilled at x=100 meters shows that the top of the formation is 90 meters deep at that point.

a) Write the particular equation expression y in terms of x.

b) If a hole were drilled to the top of the formation at x=510, how deep would it be?

c) What is the maximum depth of the top of the formation, and what is the value of x where it reaches this depth?

d) How high above the present ground level did the formation go before it eroded away?
Problem 2: Prove the identity: \[
\frac{\sec^2(x) - 6\tan(x) + 7}{\sec^2(x) - 5} = \frac{\tan(x) - 4}{\tan(x) + 2}
\]

Source: Algebra and Trigonometry, 2nd Edition, by Paul E. Foerster. Published by Addison-Wesley.