Here's what was given in class.

1. Solve for \( w \): \( 2u = w - \frac{1}{w} \). \[\text{[This is simple algebra; solving a quadratic equation.]}\]

**Solution:** Assuming \( w \neq 0 \), this is equivalent to the quadratic equation,
\[
2uw = w^2 - 1,
\]
\[
w^2 - 2uw - 1 = 0 \quad \text{(multiply by \( w \) and put all nonzero terms on one side of the equation)}.
\]

Then by the quadratic formula,
\[
w = \frac{2u \pm \sqrt{4u^2 + 4}}{2} = u \pm \sqrt{u^2 + 1}
\]

2. Solve for \( e^x \): \( 2u = e^x - e^{-x} \). \[\text{[This is a simple consequence of Problem 1.]}\]

**Solution:** This is exactly the same as Problem 1, with \( w \) replaced by \( e^x \). So the solution is
\[
e^x = u \pm \sqrt{u^2 + 1}
\]

**COMMENT.** Since \( e^x > 0 \), the expression on the right must be positive. With the - sign,
\[
u - \sqrt{u^2 + 1} < 0.
\]
Thus we discard the - sign and write \( e^x = u + \sqrt{u^2 + 1} \) as the only valid solution (students were told during the quiz that they could ignore the - sign and use only +).

3. Solve for \( x \): \( u = \frac{e^x - e^{-x}}{2} \). \[\text{[This is a simple consequence of Problem 2.]}\]

**Solution:** This equation is the same as in Problem 2 (after the equation in Problem 2 is divided by 2), so we use that solution and solve for \( x \).
\[
e^x = u + \sqrt{u^2 + 1}
\]
\[
x = \ln \left[ u + \sqrt{u^2 + 1} \right].
\]

Here's the point of it: Since \( \sinh(x) = \frac{e^x - e^{-x}}{2} \),
the solution of the equation \( u = \sinh(x) \) is
\[
x = \ln \left[ u + \sqrt{u^2 + 1} \right].
\]