In a previous advanced homework you encountered the region bounded by \( y = k \), \( y = 2 - 2x^2 \), and the \( y \)-axis, where \( k \) is a positive constant smaller than 1.

In the previous problem you used vertical slices and integrated along the \( x \)-axis. In this problem, set up an integral using horizontal slices and integrate along the \( y \)-axis.

\[
A = \int_{a}^{b} \quad \text{where the bounds of integration are}
\]

\[
a = \quad b =
\]

Evaluate your integral to find the total area. Give an exact symbolic answer involving \( k \).

\[
A = \quad \text{What value of } k \text{ produces an area of exactly 1? Be accurate to three decimal places.}
\]

\[
k = \quad \text{Be accurate to three decimal places.}
\]
The region below is bounded by $y = \sin(x)$ and $y = k - \sin(x)$, where $k$ is a positive constant a bit larger than 1.

What value of $k$ produces an area of exactly 1? Be accurate to three decimal places.

$k = _____$
Consider the region that lies in the first quadrant bounded above by \( y = 4 - x^2 \) and bounded below by the \( x \)-axis as shown.

Find the line \( y = b \) such that the area of the region above the line is equal to the area below the line. Give an exact answer.

\[ b = \_ \_ \_ \]