Find the volume of the solid generated by revolving the region bound by the
given line and curve about the x-axis.
y = \sqrt{9-x^2}, y = 0

1. The first step in solving this problem is
to find the limits of integration. To do this,
you set y = \sqrt{9-x^2} and y = 0 equal to each other and
solve for x. Doing this results in x being equal to
-2 and 2. Therefore, the limits of integration are
-2 and 2.

2. Next, we use the disk method to find
the volume of the solid that is created
by rotating the bounded area about the x-axis.
We use the disk method instead of the
washer method because the line y = 0 is
the same line as the x-axis, so the solid doesn't
have a hole in it when rotated around the x-axis.
The disk method works because when you rotate
the bounded region around a line, it creates many
circles whose radii are the value of the function at
given point. Then, all you have to do is add up
the volumes of the slices using integration.

3. Using the formula for the disk method, our radius
is \( \sqrt{9-x^2} \). By squaring this as is required by the
formula, we get \( \pi \int_0^2 (9-x^2) dx \). The 2\( \pi \) was omitted
by calling it a constant because it is constant, and, because
the function is even on a symmetric interval, we
may integrate from 0 to 2 and multiply by 2.

4. When we integrate this function, we get
\( 2\pi \int_0^2 (9-x^2) dx \).
From here, we replace the \( x \) with the limits of integration and
subtract them. Because replacing the \( x \) with \( a \) results in an answer of \( 2\pi \), we don't
need to worry about it with the remaining \( 2\pi \left( \frac{1}{3} \right) \), we carry the 2\( \pi \) through, find a
common denominator and subtract, leaving us with \( \frac{32\pi}{3} \) and because the answer is a volume
it is in cubic units.