Work for problem 2(a)

We can say that,

\[ x^2 + y^2 = 2 \Rightarrow y = \sqrt{2 - x^2} \quad (y > 0) \]

\[ (x-1)^2 + y^2 = 1 \Rightarrow y = \sqrt{1 - (x-1)^2} = \sqrt{2 - 2x} \quad (y > 0) \]

\[
R = \int_{-1}^{1} \sqrt{2 - x^2} \, dx + \int_{1}^{2} \sqrt{2 - 2x} \, dx
\]

(Note that \( y = 0 \) at \( x = \sqrt{2} \), in the graph of circle \( x^2 + y^2 = 2 \).)

Work for problem 2(b)

We can say that:

\[ x^2 + y^2 = 2 \Rightarrow x = \sqrt{2 - y^2} \quad (x > 0) \]

\[ (x-1)^2 + y^2 = 1 \Rightarrow x = 1 - \sqrt{1 - y^2} \quad (x < 1) \]

\[
R = \int_{0}^{1} \sqrt{2 - y^2} \, dy - \int_{0}^{1} (1 - \sqrt{1 - y^2}) \, dy = \int_{0}^{1} \left( \sqrt{2 - y^2} - (1 - \sqrt{1 - y^2}) \right) \, dy
\]

Continue problem 2 on page 7.
Work for problem 2(c)

Let \( r_1 = \sqrt{2} \)  
\( r_2 = 2 \cos \theta \)

The graph of \( r_2 \) goes through \((1,1)\) when \( \theta = \frac{\pi}{4} \).  
\( \therefore \sqrt{r_1^2} = 2 \cos \frac{\pi}{4} = \sqrt{2} \)

Also, as \( \theta \) increases from \( \frac{\pi}{4} \) to \( \frac{\pi}{2} \) on the graph of \( r_2 \), \( r_2 \) draws the arc of \( R_2 \) shown in the figure below.

\[
S = \int_0^{\pi/4} \frac{1}{2} r_1^2 \, d\theta + \int_{\pi/4}^{\pi/2} \frac{1}{2} r_2^2 \, d\theta \\
= \int_0^{\pi/4} \, d\theta + \int_{\pi/4}^{\pi/2} 2 \cos^2 \theta \, d\theta \\
= \int_0^{\pi/4} \, d\theta + \int_{\pi/4}^{\pi/2} (1 + \cos 2\theta) \, d\theta
\]

GO ON TO THE NEXT PAGE.
Work for problem 2(a)

\((x-1)^2 + y^2 = 1 \Rightarrow y^2 = 1-(x-1)^2 \Rightarrow y = \sqrt{1-(x-1)^2}\)

\[ \int_0^1 \sqrt{1-(x-1)^2} \, dx + \int_{\sqrt{2}}^{\sqrt{3}} \sqrt{2-x} \, dx = 0.1783 + 0.368 = 1.153 \]

\[ x^2 + y^2 = 2 \quad y = 2 - x \]

\[ y = \sqrt{2-x} \]

Work for problem 2(b)

\[ x^2 + y^2 = 2 \]

\[ x^2 = 2 - y^2 \]

\[ x = \sqrt{2-y^2} \]

\[ (x-1)^2 + y^2 = 1 \]

\[ (x-1)^2 = 1 - y^2 \]

\[ x-1 = \sqrt{1-y^2} \]

\[ x = \sqrt{1-y^2} + 1 \]

\[ \int_0^1 \sqrt{y} - (\sqrt{1 - y^2}) \, dy = 1.071 \]

Continue problem 2 on page 7.
Work for problem 2(c)

\[ S = \frac{1}{2} \int r^2 \, d\theta \quad \frac{1}{2} \int (2 \cos \theta)^2 \, d\theta \]

\[ R = \frac{1}{2} \int_{0.817}^{1.5} (2 \cos \theta)^2 \, d\theta + \frac{1}{2} \int_{0}^{0.817} (1.2)^2 \, d\theta \]

\[ = 0.255 + 0.817 \]

\[ = 1.072 \]