Sec 5.1

wrapping up

Area bet curves = Area under "top curve"
- Area under "bottom curve"

if no curve is on top consultently

ex:

\[ A = \int_a^b |f-g| \, dx \]

appropriate end points

Divide area into pieces and find area of each piece separately

\[ A = \int_a^b |f-g| \, dx \]
A new 'trick' which helps in some cases

"Thinking in terms of y!"

Find area between \( y = x-1 \) and \( y^2 = 2x + 6 \)

**Step 1:** Find intersection points

\[ y = x - 1 \quad \Rightarrow \quad (x-1)^2 = 2x + 6 \]
\[ x^2 + 1 - 2x = 2x + 6 \]
\[ x^2 - 4x - 5 = 0 \]
\[ (x-5)(x+1) = 0 \]

\( x = 5 \), \( x = -1 \)

\( y = 4 \), \( y = -2 \)

\( (5,4) \) and \( (-1,2) \) are x^2 points.
Area \rightarrow \begin{align*}
&= \int_{-1}^{5} \sqrt{2x+6} - (x-1) \, dx + \int_{-3}^{1} \sqrt{2x+6} - \sqrt{2x+6} \, dx \\
&= \int_{-1}^{5} (x-1) \, dx + \int_{-3}^{1} 0 \, dx
\end{align*}

Tedious!

Think dy \quad (\text{so left and right instead of top and bottom})

\begin{align*}
\text{Area} &= \int \text{Right curve} - \int \text{Left curve} \\
&= \int_{-2}^{4} (y+1) \, dy - \int_{-2}^{2} \sqrt{\frac{y^2-6}{2}} \, dy
\end{align*}

end pt. 2
\[
\begin{align*}
\int_{-2}^{4} \left( x + 1 - \frac{x^2}{2} + 3 \right) \, dx &= \int_{-2}^{4} \frac{-x^2}{2} + x + 4 \, dx \\
&= \left[ -\frac{x^3}{6} + \frac{x^2}{2} + 4x \right]_{-2}^{4} \\
&= \left( -\frac{64}{6} + \frac{16}{2} + 16 \right) - \left( -\frac{8}{6} + \frac{4}{2} - 8 \right) \\
&= \boxed{18}
\end{align*}
\]

HW X:
Sec 5.1 (Pg 349)
13, 16, 17, 20, 23, 25, 31