4.6 Area between the Curves

**Fundamental Theorem of Calculus**: $A = \int_a^b (f(x) - g(x)) \, dx$

- **Problem 1**: Find the area between the curves $y = x^2$ and $y = x + 2$.

\[ \int_0^1 (x + 2 - x^2) \, dx = \left[ \frac{x^2}{2} + 2x - \frac{x^3}{3} \right]_0^1 = \frac{1}{2} + 2 - \frac{1}{3} = \frac{1}{2} \]

- **Problem 2**: Find the area between the curves $y = x^3$ and $y = x$.

\[ \int_0^1 (x^3 - x) \, dx = \left[ \frac{x^4}{4} - \frac{x^2}{2} \right]_0^1 = \frac{1}{4} - \frac{1}{2} = -\frac{1}{4} \]

- **Problem 3**: Find the area between the curves $y = x^2$ and $y = x^3$.

\[ \int_0^1 (x^2 - x^3) \, dx = \left[ \frac{x^3}{3} - \frac{x^4}{4} \right]_0^1 = \frac{1}{3} - \frac{1}{4} = \frac{1}{12} \]