1 8.4: Integration by Partial Fractions

Key: Rewrite a rational expression into a sum of rational expressions each of which can be integrated.

Example: $\int \frac{x \, dx}{(x + 2)(x - 2)}$

Basic idea: If I want to rewrite $\frac{x}{(x + 2)(x - 2)}$ into a sum of 2 fractions, what should the denominators of those fractions be? Since the given fraction is a proper fraction (degree of numerator less than degree of denominator), what kind of polynomial should be in the numerator?

Find the numerators:

Integrate the rewritten expression:
Examples:

\[ \int \frac{1}{x^3 + x} \, dx = \]

\[ \int \frac{x^3 + 1}{x^2 + 4} \, dx = \]
On Beyond Average:

\[ \int \frac{(7x + 9)}{x^3 + 2x^2 + 3x} \, dx = \]