AP Calculus AB **Visual Comparison between Integral Rules (mostly Rational expressions)**

Compare Numerator and Denominator to help determine Integral Rule(s) to apply	Example #1	Example #2
1) **Only 1 Term in the Denominator** (regardless of degree differences between numerator and denominator) Solution: Consider expanding and splitting up the terms into individual fractions and applying integral rule for each term separately.	$\int \frac{x^4 - 5x^3 + 1}{2x^4} dx$	$\int \frac{4e^{4x} - e^{2x}}{6e^{3x}} dx$
2) Multiple terms in the denominator and the **Denominator has variable exponent degree that is 1 higher than the Numerator** Solution: Consider U-Substitution	$\int \frac{5\boldsymbol{x}}{7\boldsymbol{x}^2 - 4} dx$	$\int \frac{2\boldsymbol{x}^2}{\sqrt[5]{3\boldsymbol{x}^3 - 4}} dx$
3) Multiple terms in the denominator and the **Numerator has variable exponent that is Same degree OR Higher than the Denominator.** Solution: Consider Long Division and/or Synthetic Division	$\int \frac{4\boldsymbol{x} - 3}{\boldsymbol{x} - 5} dx$ Apply long division or synthetic division	$\int \frac{\boldsymbol{x}^4 + x - 4}{\boldsymbol{x}^2 + 2} dx$ Apply long division (synthetic division does **not** apply)
4) Multiple terms in the denominator and the **Denominator has variable exponent that is higher than the Numerator by 2 or more degrees**: Solution: Consider ArcTrig Integral Rules	$\int \frac{1}{\boldsymbol{x}^2 - 8x + 4} dx$ Apply Arctan Integral Rule	$\int \frac{5\boldsymbol{x}}{\sqrt{1 - \boldsymbol{x}^4}} dx$ Apply Arcsin Integral Rule