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CALCULUS 2 - REVIEW (PREVIEW) UNIT 5

POLYNOMIAL LONG DIVISION AND INTEGRATION

EXAMPLE: $\int \frac{x^3 + x - 3}{x+1} dx$

FIRST DIVIDE:

$$\begin{array}{r} x^2 - x + 2 - \frac{5}{x+1} \\ \hline x+1 \overline{)x^3 + x - 3} \\ - (x^3 + x^2) \\ \hline -x^2 + x - 3 \\ + x^2 + x \\ \hline 2x - 3 \\ - (2x + 2) \\ \hline -5 \end{array}$$

RECALL LONG DIVISION:

$$\begin{array}{r} 32 + \frac{10}{21} \\ \hline 21 \overline{)682} \\ \underline{-63} \\ \hline 52 \\ \underline{-42} \\ \hline 10 \end{array}$$

$$\int \frac{x^3 + x - 3}{x+1} dx = \int x^2 - x + 2 - \frac{5}{x+1} dx$$

$$= \frac{x^3}{3} - \frac{x^2}{2} + 2x - \int \frac{5}{x+1} dx$$

$$\left\{ \begin{array}{l} u = x+1 \\ du = dx \end{array} \right.$$

$$\frac{x^3}{3} - \frac{x^2}{2} + 2x - \int \frac{5}{u} du$$

$$\frac{x^3}{3} - \frac{x^2}{2} + 2x - 5 \ln|u| + C$$

$$= \frac{x^3}{3} - \frac{x^2}{2} + 2x - 5 \ln|x+1| + C$$

EXERCISE: $\int \frac{x^2 - x + 1}{x-2} dx$