CALCULUS 2 – REVIEW (PREVIEW) UNIT 5

POLYNOMIAL LONG DIVISION AND INTEGRATION

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

FIRST DIVIDE:

$$x+1 \;\overline{)\; x^3 + x - 3}$$

$$-(x^3 + x^2)$$

$$-x^2 + x - 3$$

$$+x^2 + x$$

$$2x - 3$$

$$-(2x + 2)$$

$$-5$$

$$x^2 - x + 2 - \frac{5}{x+1}$$

RECALL LONG DIVISION:

$$21 \;\overline{)\; 682}$$

$$63$$

$$52$$

$$42$$

$$10$$

$$32 + \frac{10}{21}$$

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

$$= \frac{x^3}{3} - \frac{x^2}{2} + 2x - \int \frac{5}{x+1}\,dx \qquad \begin{cases} u = x+1 \\ du\ dx \end{cases}$$

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

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

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

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