

4.8.29 Evaluate the indefinite integral

$$\int (2x^3 - 5x + 7) dx.$$

Solution

We have the integrand  $f(x) = 2x^3 - 5x + 7$  and we seek "the most general antiderivative" (i.e., we seek the set of all antiderivatives).

If we differentiate:  $\frac{d}{dx} [x^n] = n x^{n-1}$

So we increase exponents by 1 and "adjust" to find antiderivatives

(based on the formula  $\frac{d}{dx} \left[ \frac{x^{n+1}}{n+1} \right] = x^n$ ).

So

$$\int (2x^3 - 5x + 7) dx$$

$$= 2 \left( \frac{x^4}{4} \right) - 5 \left( \frac{x^2}{2} \right) + 7x + C$$

$$= \boxed{\frac{x^4}{2} - \frac{5x^2}{2} + 7x + C.}$$

□