6.1. Antiderivatives and Indefinite Integrals

(1) A function F is called an ________________________ of f on an interval I of $F'(x) = f(x)$ for al $x \in I$.

(2) Theorem: If F is an antiderivative of f on an interval I and C is any constant, then $F(x) + C$ also defines an antiderivative of f on I.

(3) If F is an antiderivative of f, then we describe the antiderivative of a function in the most general terms by using the notation ________________________ to represent all possible antiderivatives of f.

(4) Notation: If $F(x)$ is an antiderivative of $f(x)$ then we write

Remark 6.1.1. *In the e-grade "fill in the formula entry box", the plus C is added for you. If you type in "+C" your answer will be marked incorrect – do NOT put "+C"*

Rules for the Most General Antiderivative of f

(1) $\int k\,dx =$ (where k is a constant)

(2) $\int f(x) \pm g(x)\,dx =$

(3) $\int kg(x)\,dx =$ (where k is a constant)

(4) $\int x^n\,dx =$ (for $n \neq -1$)

(5) $\int x^{-1}\,dx =$

(6) $\int e^x\,dx =$

Examples

Example 6.1.1. *Evaluate* $\displaystyle\int -6\,dx$.

Example 6.1.2. *Evaluate* $\displaystyle\int dx$.

Example 6.1.3. *Evaluate* $\displaystyle\int -4x^7\,dx$.

Example 6.1.4. *Evaluate* $\displaystyle\int (3 + 2u^{-4} - \sqrt{u})\,du$.

Example 6.1.5. *Evaluate* $\displaystyle\int \frac{-4}{z}\,dz$.

Example 6.1.6. *Evaluate* $\displaystyle\int t + 12e^t\,dt$.

Example 6.1.7. *Find* y *if* $\dfrac{dy}{dx} = -6x^{-2} + x^{-1}$.

Example 6.1.8. *Find* y *so that* $y(1) = -4$ *and* $\dfrac{dy}{dx} = -6x^{-2} + x^{-1}$.

Example 6.1.9. *Find w if* $\dfrac{dw}{dv} = -4v^{-1} + 5v^{-2} - e^{v}$.

Example 6.1.10. *Evaluate* $\displaystyle\int \frac{x^3 + 4x^2 - 3x}{x^3}\, dz$.

Homework: 6.1 p. 373 # 1, 11, 13, 15, 17, 27, 29, 39, 45, 51, 59, 67, 71, 83 work e-grade practice at least 2 times.