Math 122-001 Fall 2017 Team #4: Antiderivatives

Preparation- Kayla Ballo

Preparation is rearranging the problem to make it easier to solve before applying the antiderivative rules. For example $f(x) = \sqrt{x}\,dx \rightarrow f(x) = x^{1/2}dx$

$$\int \frac{5x}{\sqrt{x}} + \frac{\sqrt{x}}{x}\,dx$$

$$\int \frac{15}{x^5} - \frac{21}{x}\,dx$$

$$\int \frac{3-x}{x^2}\,dx$$

A1/A2/A3- Julie Piano

A1—Constant Rule

Add a constant if you need it.

An antiderivative of $f(x) = 3e^x - 28x^3$ could be $F(x) = 3e^x - 7x^4 + 16$ or $F(x) = 3e^x - 7x^4 + 3$ or any other constant can be added. This is because there is not a single antiderivative.

A2—Addition Rule

The antiderivative of a sum is the sum of the antiderivatives.

$f(x) + g(x) \rightarrow F(x) + G(x)$

A3—Subtraction Rule

The antiderivative of a subtraction is the subtraction of the antiderivatives.

$f(x) - g(x) \rightarrow F(x) - G(x)$

Examples:

Give an antiderivative of $f(x) = \frac{x^7}{7} - \frac{7}{x}$

Give another antiderivative of $f(x) = \frac{x^7}{7} - \frac{7}{x}$

$$\int 8x^3 + 21x - 7\,dx$$

$$\int 11x^{15} - 3\sqrt[6]{x} - \frac{4}{\sqrt[8]{x}}\,dx$$

A4/A5/A6- Karli Sinclair

A4) The antiderivative of $cf(x)$ is $cF(x)$,for any real number c, and any function f

A5) The antiderivative of $f(x)=1$ is $F(x)=x$ $\int 1dx = x$ or $\int dx = x$

A6) Power Rule: The antiderivative of $f(x) = x^n$ is $F(x) = \frac{x^{n+1}}{n+1},\ n \neq 1$

Examples:

$$\int \sqrt{15z^3}\,dz$$

$$\int 11\,dx$$

$$\int \frac{x^{1/2}+x}{x}$$

A7/A8/A9- Sarah Baron

A7) $\int e^x dx = e^x$

A8) $\int a^x dx = \frac{a^x}{\ln(a)},\ a > 0$

A9) $\int \frac{1}{x} dx = ln|x|$

Examples:

$$\int 4e^x - 3x^2 + 6x\,dx$$

$$\int 57^x dx$$

$$\int 5\sqrt{x} + 6x^{-1}\,dx$$

Substitution Part I.- Maggie Dwyer

A polynomial to the power n, multiplied by the derivative of the polynomial equals the polynomial to the n+1 power over n+1.

$$\int f(x)^n * f'(x)\,dx = \frac{f(x)^{n+1}}{n+1},\ n \neq 1$$

Examples:

$$\int \left(8x^3 - 4x + 2\right)^7 \left(24x^2 - 4\right)\,dx$$

$$\int \left(e^x + 8x + 3\right)^{29} \left(e^x + 8\right) dx$$

$$\int \left(x^2 - 6x - 19\right)^{139} (x-3) dx$$

Substitution Part III.-Lama

$$\int \frac{f'(x)}{f(x)}\,dx = ln\left|f(x)\right|$$

Examples:

$$\int \frac{4y}{6y^2+3}\,dy$$

$$\int \frac{dx}{7x^3 + \frac{4}{3}}$$

$$\int \frac{5 + e^x}{e^x + 5x}\, dx$$

<u>Integration with Fractions</u>- Elizabeth Arnold

Examples:

$$\int \frac{5 + x^2}{(x^3 - 4)^{15}}\, dx$$

<u>Management of Antiderivatives that Satisfies F(x)=?</u>- Jocelyn McCloud

We say that F(x) is an antiderivative of f(x) if F(x)=f(x).

We write F(x)= $\int f(x)dx$

We say F(x) is the indefinite integral of f(x).

Examples:

- Find an antiderivative of $f(x) = \frac{x^3}{3} - \frac{3}{x}$ that satisfies F(1)=1
- Find an antiderivative of $f(x) = 3x^3 - 7x^2 + 9x - 15$ that satisfies F(0)= 1254.3
- Find the antiderivative of $f(x) = \frac{2}{x} - \frac{5}{x^5}$ that satisfies F(3)= 29