4.1B Particular Solutions

<u>WCID?</u> I can find a particular solution of an antiderivative

A. Evaluate: $\int 2x\,dx$ $= x^2 + C$

  **this is called the general solution

1. <u>Particular Solution-</u> a solution for a specific instance

2. Given a value for x and $f(x)$, you will now find C

Examples:

Evaluate $\int 2x\,dx$, where $F(2)=5$

$$x^2+C \longrightarrow f(x)=x^2+1$$

$$(2)^2+C=5 \quad C=1$$

Evaluate $\int \dfrac{1}{x^2}\,dx$, where $F(1)=0$

$$\int x^{-2}\,dx \longrightarrow \dfrac{-1}{x}+1$$

$$\dfrac{x^{-1}}{-1}+C=\dfrac{-1}{x}+C \longrightarrow \dfrac{-1}{1}+C=0$$

$$\cdot 1+C=0$$

$$C=1$$

If $f'(x)=\cos x$, find $f(x)$ if $F(\pi)=2$

$$\int \cos x\,dx = \sin x + C \longrightarrow \sin x + 2 = f(x)$$

$$= \sin(\pi)+C=2$$

$$\Rightarrow C=2$$

If $f'(x) = 2x + 3$, find $f(x)$ if $F(-3) = 5$

$\int 2x + 3 \, dx$

$x^2 + 3x + C$

$x^2 + 3x + 5$

$(-3)^2 + 3(-3) + C = 5$

$9 - 9 + C = 5$

$C = 5$

B. Similar to second derivatives, we can do antiderivatives twice

1. These are applications of particular solutions

Examples

If $f''(x) = 30x$, find $f(x)$ if $f(1) = 1$ and $f'(2) = 55$

$\int 30x \, dx$

$15x^2 + C$

$15(2)^2 + C = 55$

$C = -5$

$\int 15x^2 - 5 \, dx$

$5x^3 - 5x + C$

$5(1)^3 - 5(1) + C = 1$

$C = 1$

$5x^3 - 5x + 1$

If $f''(x) = 4$, find $f(x)$ if $f(2) = 14$ and $f'(1) = 8$

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