

Particular Solution

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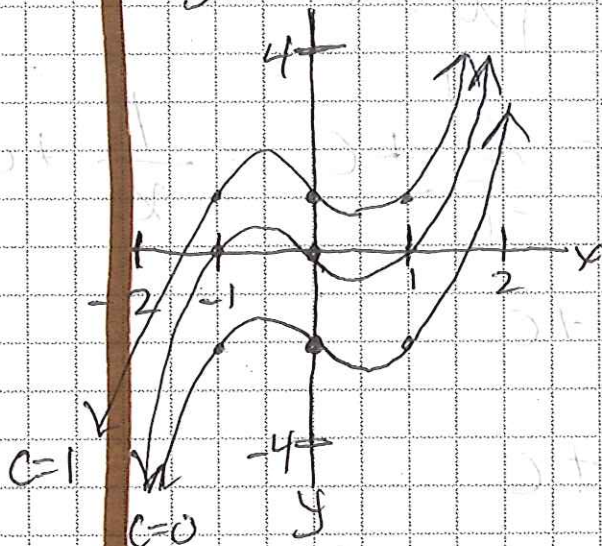
ES: What is a particular solution?
How do we find it?

Examine

$$\int (3x^2 - 1) dx = \frac{3x^3}{3} - x + C$$

$$= x^3 - x + C$$

General solution.
The C makes this
have many solutions.



In many application of Integration,
you can determine a particular solution.
You need to know the initial condition $y = f(x)$
 (x, y)

(ex)

Find the particular solution
when $f(2) = 4$
 $(2, 4)$
 (x, y)

if $f'(x) = 3x^2 - 1$

[Step 1] $\int (3x^2 - 1) dx = x^3 - x + C$

[Step 2] $y = x^3 - x + C$ plug in $(2, 4)$
 $4 = 2^3 - 2 + C$
 $4 = 6 + C$
 x, y

[Step 3] so,
 $f(x) = x^3 - x - 2$
is the particular solution.

ex 2

Find the particular solution if

Practice

$$f'(x) = \frac{1}{x^2} \text{ and } f(1) = 0$$

$(1, 0)$
x, y

Step 1

$$\int \frac{1}{x^2} dx = \int x^{-2} dx$$

$$= \frac{x^{-1}}{-1} + C = -\frac{1}{x} + C$$

Step 2

$$y = -\frac{1}{x} + C$$

$$0 = -\frac{1}{1} + C$$

$$0 = -1 + C$$

+1 +1

$$1 = C$$

Step 3

So $f(x) = -\frac{1}{x} + 1$
is the particular solution.

Summary