Finding Specific Solutions

① $F(x) = \int f(x)\,dx$ ⟶ general solution (includes "+c")

② need a known value $F(x_0) = y_0$

- substitute x_0 & y_0 into the general solution

↓

solve for "c"

③ substitute the value c back into the general solution

↘

specific solution

Integral Properties

$$\int c\,f(x)\,dx = c\int f(x)\,dx$$

$$\int [f(x)+g(x)]\,dx = \int f(x)\,dx + \int g(x)\,dx$$

Integral Identities

$$\int x^n\,dx = \frac{x^{n+1}}{n+1} + C \qquad n \neq -1$$

$$\int \frac{1}{x}\,dx = \ln|x| + C$$

$$\int e^x\,dx = e^x + C$$

$$\int \sin(x)\,dx = -\cos(x) + C$$

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

① $G(x)=\int(9x^4+3x^2-15)dx$ $\quad G(1)=5$

② $Q(r)=\int 12\sin(r)\,dr$ $\qquad$ $Q(\pi)=2$

③ acceleration $= a = 2$

$v(t) = \int a \, dt$

The object is initially at rest.

④ $a = -3\cos(t)$

$v(0) = 0$

$x(0) = 3$

find the specific solution for $x(t)$.

⑤ $a(t) = 6e^t$

$v(0) = 16$

find the specific solution for $v(t)$.