Definition: A function $F(x)$ is called an antiderivative of $f(x)$ on an interval if

$$F'(x) = \boxed{}.$$

for all x in that interval.

Problem: Find the derivative of the following functions,

$$\begin{aligned} F(x) &= x^5 + 1, & F'(x) &= \boxed{} \\ F(x) &= x^5 - 20, & F'(x) &= \boxed{} \\ F(x) &= x^5 + \sqrt{3}, & F'(x) &= \boxed{} \\ F(x) &= x^5, & F'(x) &= \boxed{} \end{aligned}$$

Result: If F is an antiderivative of f on an interval, then the most general antiderivative of f on that interval is

$$F(x) + C,$$

where C is an arbitrary constant.

Function	General Antiderivative
$b\,f(x)$	$b\,F(x) + C$
$f(x) \pm g(x)$	$F(x) \pm G(x) + C$
x^n	
$\frac{1}{x}$	
e^x	
$\sin x$	
$\cos x$	
$\sec^2 x$	
$\sec x \tan x$	

Exercises

Find the following indefinite integrals

1. $\int \left(x^2 + x^{-1} + 3\right)\, dx$

2. $\int \sqrt{x}\, dx$

3. $\int \cos x\, dx$

4. $\int \sin x\, dx$

5. $\int \left(\frac{1}{x^3} + x^4 - x\right)\, dx$

6. $\int \sec^2 x\, dx$

7. $\int \sec x\, \tan x\, dx$