MTH 252 Lab
Antiderivatives

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Purpose

You have finished differential calculus! This is the first foray into integral calculus – at this time, we can think of this as undoing differential calculus.

(a) What is the difference between a particular antiderivative and a general antiderivative?

(b) Are you comfortable with your derivative formulas? If not, work on those first, because everything from now on will rely on you knowing those formulas.

Prompts

1. Complete the following table by finding a particular antiderivative of the function stated on the left.

Function	**Particular Antiderivative**
c	
$x^n, n \neq 1$	
$\frac{1}{x}$	
e^x	
$\cos x$	
$\sin x$	
$\sec^2 x$	
$\sec x \tan x$	
$\frac{1}{\sqrt{1-x^2}}$	
$\frac{1}{1+x^2}$	

2. Evaluate the following indefinite integrals.

a. $\int 3 \, dx$

b. $\int (-7) \, dx$

c. $\int (4x) \, dx$

d. $\int \sqrt[7]{x^4} \, dx$

e. $\int \frac{2}{\sqrt[5]{x^6}} \, dx$

f. $\int e^x \, dx$

g. $\int 2\cos x \, dx$

h. $\int \pi \sin x \, dx$

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

j. $\int (-\csc x \cot x) \, dx$

k. $\int \frac{1}{1+x^2} \, dx$

l. $\int \frac{1}{x} \, dx$

3. Let $f(x) = \dfrac{2}{x} - 6x^2 + \dfrac{1}{1+x^2}$.

   (a) Find the most general antiderivative of f.

   (b) Find the antiderivative of f that passes through the point $(1, 0)$.

4. Evaluate $\displaystyle\int 3\cos t - \frac{t^3 + 2\sqrt[3]{t}}{t^2}\, dt$ by first rewriting the integrand so that it has no fractions (except possibly in the powers).

5. Let $f''(x) = e^x - \sin x + 3x^4$.

   (a) Find every function $f'(x)$ satisfying the equation above.

   (b) Find $f'(x)$ such that $f'(0) = -1$.

   (c) Using the formula for $f'(x)$ that you just found, find $f(x)$ such that $f(0) = 2$.