MATH 16020 Lesson R: Review of Integration

Spring 2021

Recall. Derivatives _____.

Two ways to view integration:

(A) _____

Definition. An **antiderivative** of $f(x)$ is _____

Use power rule for derivatives to get the **antiderivative power rule**.

Other basic antiderivatives come from derivative rules:

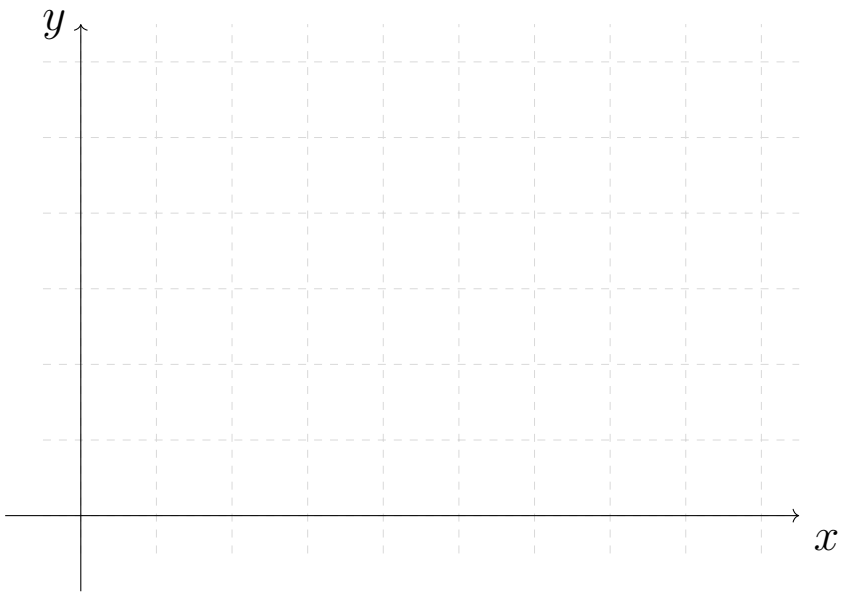
Derivatives	**Antiderivatives**
$\frac{d}{dx}(C) = 0$	$\int 0 \; dx = C$
	$\int b \; dx = bx + C$
$\frac{d}{dx}(\ln(x)) = \frac{1}{x}, \; x > 0$	$\int \frac{1}{x} \; dx = \ln(\lvert x \rvert) + C$
$\frac{d}{dx}(e^x) = e^x$	$\int e^x \; dx = e^x + C$
$\frac{d}{dx}(\tan(x)) = \sec^2(x)$	$\int \sec^2(x) \; dx = \tan(x) + C$
$\frac{d}{dx}(\csc(x)) = -\csc(x)\cot(x)$	$\int \csc(x)\cot(x) \; dx = -\csc(x) + C$
$\frac{d}{dx}(\sec(x)) = \sec(x)\tan(x)$	$\int \sec(x)\tan(x) \; dx = \sec(x) + C$
$\frac{d}{dx}(\cot(x)) = -\csc^2(x)$	$\int \csc^2(x) \; dx = -\cot(x) + C$

Example 1. Evaluate $\int 6\sec(x)(\sec(x) + 5\tan(x))dx$

Example 2. If $y'(x) = \dfrac{x^2 - 1}{\sqrt{x}}$ and $y(4) = 3$, find $y(x)$.

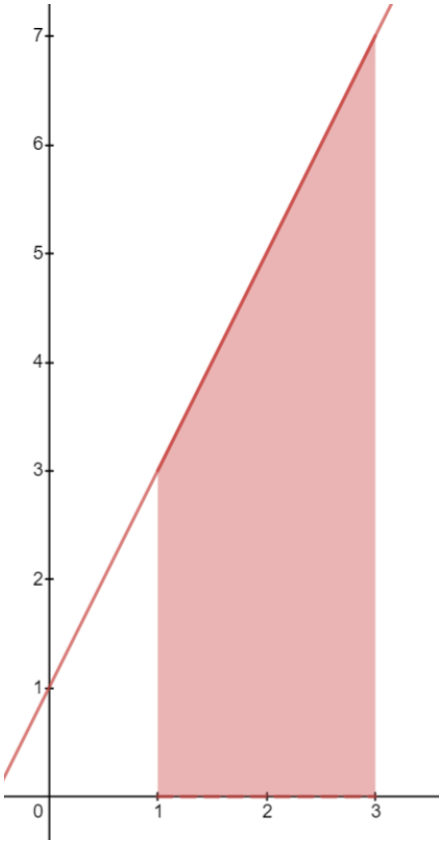
(B)_____

For these integrals, ALWAYS need _____.



To evaluate these integrals, need the **Fundamental Theorem of Calculus (FTC)**, stated below:

Example 3. What integral can be used to find the area of the shaded region below? What is this area?



Example 4. A strain of bacteria grows at a rate modeled by $r(t) = 8e^t$, where t is in hours since 8AM and $r(t)$ is in number of bacteria per hour.

A. How many bacteria develop from 11AM to 3PM? Round to nearest number of bacteria.

B. How many hours after 8AM will the strain gained 40 more bacteria? Round to nearest hundredth.