

December 2

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Final Exam Review Topics

Here is the list of integral rules you should know.

$\int (f(x) + g(x)) dx = \int f(x) dx + \int g(x) dx$	Addition Rule
$\int cf(x) dx = c \int f(x) dx$	Constant Scalar Rule
$\int_a^b f(x) dx = \int_a^c f(x) dx + \int_c^b f(x) dx$	
$\int_a^a f(x) dx = 0$	
$\int_b^a f(x) dx = - \int_a^b f(x) dx$	
$\int_a^b f(x) dx = F(b) - F(a)$	Fundamental Theorem of Calculus
$\frac{d}{dx} \int_a^x f(t) dt = f(x)$	
$\frac{d}{dx} \int_a^{g(x)} f(t) dt = f(g(x))g'(x)$	
$\int k dx = kx + C$	
$\int x^n dx = \frac{1}{n+1} x^{n+1} + C$	if $n \neq -1$
$\int \frac{1}{x} dx = \ln x + C$	
$\int e^x dx = e^x + C$	
$\int b^x dx = \frac{1}{\ln b} b^x + C$	
$\int \cos x dx = \sin x + C$	Trig Functions
$\int \sin x dx = -\cos x + C$	
$\int \sec^2 x dx = \tan x + C$	
$\int \tan x \sec x dx = \sec x + C$	
$\int \csc^2 x dx = \cot x + C$	
$\int \cot x \csc x dx = \csc x + C$	
$\int \frac{1}{\sqrt{1-x^2}} dx = \sin^{-1} x + C$	Inverse Trig Functions
$\int \frac{1}{x^2+1} dx = \tan^{-1} x + C$	

And the things you should be able to do:

Limits

- Take limits of complicated functions (including absolute values)
- Squeeze Theorem for Limits (and how to properly justify your use of it)
- Use L'Hôpital's Rule (Handle forms $\frac{0}{0}$, $\frac{\infty}{\infty}$, $0 \cdot \infty$, $\infty - \infty$, $f(x)^{g(x)}$)

Derivatives

- Evaluate derivative as a limit of difference quotient
- Take derivatives (Chain rule, product rule, quotient rule, trig functions, inverse trig functions, etc)
- Find equation of a tangent line
- Implicit Differentiation

Applications of Derivatives

- Optimization Problems
- Related rates
- Find absolute extrema on an interval
- Analyze a function (Find and classify critical points, intervals of increasing/decreasing, intervals of concavity, zeroes, asymptotes)
- Linear approximation (and state whether it is an under or over estimate) - and do this with minimal guidance
- Use Intermediate Value Theorem
- use Mean Value Theorem and Rolle's theorem

Integrals

- Integrals (definite & indefinite, substitution rule, polynomials, trig functions, exponential functions)
- Use Fundamental Theorem of Calculus