University of Wyoming

Math 2200—Spring 2020

Calculus I

Department of Mathematics

Final Exam Study Guide

The Final Exam is cumulative. About 70% of the weight will be based on Sections 4.9–5.4 of the textbook, and the remaining weight on the earlier course content. It is a 120-minute exam available online through your MyLab Math link in the WyoCourse site for your calculus class. The exam will be available for a 72-hour period, Wed May 13 through Fri May 15, but you are advised to start earlier rather than later to avoid overloaded servers. In particular, morning hours are the best time to successfully maintain a connection for the duration of the exam. If you are cut off before submitting your exam, try again a little later. You may use your textbook and personal notes, as well as a calculator; but you must work on your own without help from human, computer or internet sources (other than the textbook itself).

The following skills are considered important preparation for the Exam. This is not a complete list of topics covered.

Problem Type	**Examples in the Text**
From Exam 1: Given a function $f(x)$, calculate 1-sided limits at a given point $x = a$ and use them to determine whether $f(x)$ is continuous at $x = a$. Identify points where f is not differentiable. Find derivatives using the definition.	§2.6: 13–20, 35–40, 84–85; §3.1: 33–46; §3.2: 43–54.
From Exam 2: Given compositions of the form $h(x) = f(g(x))$, calculate the derivative $h'(x)$ using the chain rule. This category includes implicit differentiation.	§3.7: 7–36; §3.8: 5–24.
From Exam 3: Given a function $f(x)$ defined on an interval $[a, b]$, find: • all of the critical points of $f(x)$ on $[a, b]$, • the values of x and $f(x)$ where f has its absolute maximum and absolute minimum values, • the intervals on which $f(x)$ is concave up and concave down.	§4.2: 17–38, 57–70.
Given a function $f(x)$, find the general antiderivative F (i.e. solve $F' = f$). Also find particular solutions satisfying an initial condition such as $F(a) = b$.	§4.9; 23–32, 67–74.
Given a function $f(x)$ and a partition $a = x_1 < x_2 < \cdots < x_n = b$ on an interval $[a, b]$, and given values of $f(x_j)$ at each point of the partition, calculate left and right Riemann sums for $f(x)$.	§5.1: 19–26, 35–36.
Use the Fundamental Theorem of Calculus to calculate definite integrals of the form $\int_a^b f(x)\,dx$.	§5.3: 29–50.
Use the Fundamental Theorem of Calculus to differentiate functions of x defined by integrals of the form $\int_a^x f(t)\,dt$ and $\int_{a(x)}^{b(x)} f(t)\,dt$.	§5.3: 61–68
Calculate definite integrals of the form $\int_a^b f(x)\,dx$ using geometric formulas for area when the graph of $f(x)$ forms a triangle, trapezoid, or part of a circle.	§5.2: 25–32.
Given a function $f(x)$ defined on an interval $[a, b]$, calculate its average value $\overline{f} = \frac{1}{b-a} \int_a^b f(x)\,dx$. Also find c in $[a, b]$ where $f(x) = \overline{f}$.	§5.4: 21–34, 39–44.

You may wish to refer to these formulas during the exam (although due to the online format of the exam, these formulas will not appear there).

$f(u)$	$f'(u)$
$\tan u$	$\sec^2 u$
$\cot u$	$-\csc^2 u$
$\sec u$	$\sec u \tan u$
$\csc u$	$-\csc u \cot u$
$\ln g(u)$	$g'(u)/g(u)$
$\log_b u$	$1/(u \ln b)$
$\sin^{-1} u$	$1/\sqrt{1-u^2}$
$\tan^{-1} u$	$1/(1+u^2)$
$\sec^{-1} u$	$1/(\lvert u\rvert\sqrt{u^2-1})$
$\cos^{-1} u$	$-1/\sqrt{1-u^2}$
$\cot^{-1} u$	$-1/(1+u^2)$
$\csc^{-1} u$	$-1/(\lvert u\rvert\sqrt{u^2-1})$

Chain rule: $(f \circ g)'(x) = f'(g(x))g'(x)$