

FINAL EXAM STUDY GUIDE

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The Final Exam takes place on **Friday, August 12th at 10:10 am**. It counts for 30 % of your grade, and covers chapter 5, sections 6.1, 6.5, as well as sections 2.3, 2.6, 4.4 (limits), 3.1 - 3.6 (derivatives), and 4.1 (max/min). This is the study guide for the exam, and contains **everything** you'll need to know for the exam.

Note: 1.3.4 means 'Problem 4 in section 1.3'

Know how to:

INTEGRATION

- Find the general antiderivative of a function (4.9.1, 4.9.3, 4.9.5, 4.9.7, 4.9.13, 4.9.14, 4.9.15, 4.9.20, 4.9.23, 4.9.27)
- Find the antiderivative of a function which satisfies a certain condition like $f(0) = 3$ (4.9.29, 4.9.39, 4.9.46)
- Evaluate an integral using the definition of the integral (5.2.21, 5.2.22, 5.2.23, 5.2.24, 5.2.26, 5.2.27)
- Evaluate a limit by expressing it as an integral, and then evaluating that integral using the FTC (5.2.69, 5.2.70, 5.3.69, 5.3.70)
- Evaluate an integral by recognizing it as an area (5.2.36, 5.2.39)
- Evaluate integrals by using the FTC (any problem between 5.3.19 and 5.3.40 and between 5.4.21 and 5.4.42 works, try 5.3.19, 5.3.21, 5.3.24, 5.3.27, 5.3.30, 5.3.31, 5.3.33, 5.3.38, 5.3.40, 5.4.21, 5.4.23, 5.4.25, 5.4.27, 5.4.30, 5.4.32, 5.4.35, 5.4.37)
- Differentiate integrals using the FTC (5.3.7, 5.3.11, 5.3.13, 5.3.14, 5.3.15, 5.3.17, 5.3.53, 5.3.55, 5.3.56)
- Evaluate $\int f(x)dx$ (5.4.5, 5.4.7, 5.4.9, 5.4.11, 5.4.12, 5.4.19)
- Evaluate integrals using the substitution rule (any problem between 5.5.7 and 5.5.70 works, try 5.5.7, 5.5.8, 5.5.9, 5.5.11, 5.5.16, 5.5.19, 5.5.21, 5.5.25, 5.5.29, 5.5.31, 5.5.41, 5.5.53, 5.5.54, 5.5.58, 5.5.59, 5.5.62, 5.5.63, 5.5.67)
- Evaluate an integral using the fact that $\int_{-a}^a f(x)dx = 0$ if f is odd (5.5.57, 5.5.60)
- Find the area of the region between two given curves (any problem between 6.1.5 and 6.1.28 works, try 6.1.5, 6.1.6, 6.1.7, 6.1.9, 6.1.13, 6.1.13, 6.1.24, 6.1.25, 6.1.27. On the exam, you **won't** have to integrate with respect to y)
- Find the average value of a function on a given interval (6.5.1, 6.5.4, 6.5.2, 6.5.7)

Date: Thursday, August 4th, 2011.

LIMITS

Note: On the exam, you are allowed to use l'Hopital's rule!

- **Find limits of a function:**

- Step 1: Just by plugging in (2.3.3, 2.3.6, 2.3.9)
- Step 2: By noticing that it's of the form $\frac{1}{0^+} = \infty$ or $\frac{1}{0^-} = -\infty$ (2.2.25, 2.2.28, 2.2.29)
- Step 3: By factoring out the numerator and the denominator and simplifying (2.3.12, 2.3.13, 2.3.14, 2.3.15, 2.3.16, 2.3.17, 2.3.26)
- Step 4: Whenever there is a square root, by multiplying numerator and denominator by the conjugate form (2.3.21, 2.3.23, 2.3.29, 2.3.30, 2.3.60)
- Step 5: By using the squeeze theorem (2.3.35, 2.3.37, 2.3.38)
- Step 6: By calculating $\lim_{x \rightarrow a^-}$ and $\lim_{x \rightarrow a^+}$ and by noticing that they're equal or not (2.3.39, 2.3.40, 2.3.42, 2.3.46(a)(b), 2.3.47(a)(b))

Note: If you need more practice, try the following set of problems: 2.3.22, 2.3.8, 2.3.11, 2.3.12, 2.3.36

- **Find limits at infinity of a function:**

- Step 1: Just by plugging in (2.6.15, 2.6.30)
- Step 2: By factoring out the highest power out of an expression (2.6.31)
- Step 3: By factoring out the highest power of the numerator and the denominator (2.6.16, 2.6.17, 2.6.19, 2.6.21, 2.6.33)
- Step 4: By factoring out the highest power of x out of a square root (2.6.22, 2.6.23, 2.6.24, also try those out with $-\infty$ replacing ∞ , and vice-versa) **Note:** Remember that $\sqrt{x^2} = |x| = x$ (if $x > 0$) and $= -x$ (if $x < 0$)
- Step 5: By using the conjugate form, making sure to do Step 4 first (2.6.25, 2.6.26, 2.6.27)
- Step 6: By using the squeeze theorem (2.6.35, 2.6.53(a), 2.6.57)

Note: If you need more practice, try the following set of problems: 2.6.30, 2.6.29, 2.6.20, 2.6.37(c)

- **Use l'Hopital's rule to evaluate limits** (any problem between 4.4.5 and 4.4.64 works, for example, try 4.4.5, 4.4.13, 4.4.15, 4.4.17, 4.4.19, 4.4.21, 4.4.27, 4.4.29, 4.4.40, 4.4.43, 4.4.47, 4.4.51, 4.4.53, 4.4.59, 3.3.63)

DERIVATIVES

- **Differentiate functions using:**

- Simple rules, i.e. the power rule, sum/difference rule, and $(e^x)' = e^x$ (3.1.3, 3.1.5, 3.1.6, 3.1.7, 3.1.8, 3.1.11, 3.1.12, 3.1.13, 3.1.14, 3.1.15, 3.1.17, 3.1.21, 3.1.31)
- Product and quotient rules (3.2.3, 3.2.4, 3.2.5, 3.2.6, 3.2.13, 3.2.14, 3.2.15, 3.2.17, 3.2.19, 3.2.23, 3.2.23, 3.2.26)
- Trigonometric rules (3.3.1, 3.3.2, 3.3.5, 3.3.9, 3.3.10, 3.3.13)
- Chain rule (3.4.7, 3.4.8, 3.4.9, 3.4.10, 3.4.13, 3.4.14, 3.4.17, 3.4.19, 3.4.23, 3.4.35, 3.4.29, 3.4.39, 3.4.40, 3.4.42, 3.4.45, 3.4.46)
- Implicit differentiation (3.5.5, 3.5.6, 3.5.7, 3.5.9, 3.5.11, 3.5.13, 3.5.17, 3.5.19)
- Inverse trig functions (3.5.45, 3.5.46, 3.5.47, 3.5.52)
- Derivative of $\ln(x)$ (3.6.2, 3.6.3, 3.6.9, 3.6.10, 3.6.12, 3.6.13, 3.6.19, 3.6.28, 3.6.30, 3.6.49)

- Logarithmic differentiation (3.6.37, 3.6.38, 3.6.41, 3.6.42, 3.6.43, 3.6.45, 4.6.46, 3.6.47, 4.6.50)
- Find equations of tangent lines to a function/curve at a given point (3.1.33, 3.1.34, 3.2.31, 3.2.32, 3.3.22, 3.3.23, 3.3.24, 3.4.51, 3.4.52, 3.4.53, 3.5.25, 3.5.26, 3.5.27, 3.5.29)
- Find second derivatives (3.1.45, 3.2.27, 3.2.28, 3.2.30, 3.2.41, 3.3.28(a), 3.3.29, 3.4.50, 3.6.23, 3.6.24)

MAX/MIN

- Find the absolute maximum/minimum of a function using the closed interval method (4.1.47, 4.1.48, 4.1.49, 4.1.52, 4.1.53, 4.1.60, 4.1.61, 4.1.68(b))