MATH 104, LECTURE 2 STUDY PROBLEMS FOR EXAM #2 SPRING 2011

This is a collection of study problems in preparation for the second in-class exam, which will be given on Monday, Feb. 28, 2011. It is in addition to the sample exam, and serves as an optional second sample exam (but not for credit).

Do the following ten problems under the same conditions as the actual exam. Give yourself 50 minutes. While doing these problems, you may refer to a two-sided handwritten sheet of notes, not to exceed 8 1/2 by 5 1/2 inches. No other notes should be consulted, and you should not use any electronic devices such as calculators or computers. Eight of the problems below are from old final exams; those can be found by going to

⟨http://www.math.upenn.edu/ugrad/calc/m104/oldexams.html⟩.

1. Spring 2009 final, #1.
2. Spring 2009 final, #2.
3. Spring 2009 final, #18.
4. Spring 2009 make-up final, #8.
5. Spring 2009 make-up final, #18.
6. Spring 2008 final, #9.
7. Spring 2008 final, #10.
8. Spring 2007 final, #11.
9. Using the table of integrals on the next page, evaluate $\displaystyle\int \frac{dx}{x\sqrt{9x^2-1}}$.

(a) $\sin^{-1}(3x)+C$ (b) $\sin^{-1}(x/3)+C$ (c) $\cos^{-1}(3x)+C$

(d) $\cos^{-1}(x/3)+C$ (e) $\sec^{-1}(3x)+C$ (f) $\sec^{-1}(x/3)+C$

10. Which of the following is a good approximation to $\displaystyle\int_0^2 e^{x^2}\,dx$?

(a) $\frac{1}{10}\left(e^{0^2}+2e^{.2^2}+2e^{.4^2}+\cdots+2e^{1.8^2}+e^{2^2}\right)$

(b) $\frac{1}{20}\left(e^{0^2}+2e^{.1^2}+2e^{.2^2}+\cdots+2e^{.9^2}+e^{1^2}\right)$

(c) $\frac{1}{10}\left(e^{0^2}+4e^{.2^2}+2e^{.4^2}+\cdots+4e^{1.8^2}+e^{2^2}\right)$

(d) $\frac{1}{10}\left(e^{.1^2}+2e^{.3^2}+2e^{.5^2}+\cdots+2e^{1.7^2}+e^{1.9^2}\right)$

(e) $\frac{1}{20}\left(e^{0^2}+e^{.1^2}+e^{.2^2}+\cdots+e^{1.9^2}+e^{2^2}\right)$

(f) $\frac{1}{20}\left(e^{0^2}-e^{.2^2}+e^{.4^2}-\cdots+e^{1.8^2}-e^{2^2}\right)$

Short table of integrals

$$\int \sqrt{u^2+c}\, du = \frac{u}{2}\sqrt{u^2+c} + \frac{c}{2}\ln\left|u+\sqrt{u^2+c}\,\right| \tag{1}$$

$$\int \sqrt{b^2-u^2}\; du = \frac{u}{2}\sqrt{b^2-u^2} + \frac{b^2}{2}\sin^{-1}(\frac{u}{b}) \tag{2}$$

$$\int \frac{du}{\sqrt{u^2+c}} = \ln\left|u+\sqrt{u^2+c}\,\right| \tag{3}$$

$$\int \frac{du}{\sqrt{b^2-u^2}} = \sin^{-1}(\frac{u}{b}) \tag{4}$$

$$\int \frac{\sqrt{b^2\pm u^2}}{u} du = \sqrt{b^2\pm u^2} + b\ln\left|\frac{\sqrt{b^2\pm u^2}-b}{u}\right| \tag{5}$$

$$\int \frac{\sqrt{u^2-b^2}}{u} du = \sqrt{u^2-b^2} - b\cos^{-1}\left|\frac{b}{u}\right| \tag{6}$$

$$\int \frac{du}{u\sqrt{b^2\pm u^2}} = \frac{1}{b}\ln\left|\frac{\sqrt{b^2\pm u^2}-b}{u}\right| \tag{7}$$

$$\int \frac{du}{u\sqrt{u^2-b^2}} = \frac{1}{b}\sec^{-1}(\frac{u}{b}) \tag{8}$$