

First posting: Tue Feb 21 05:52:03 MST 2006 /m175.sp06/handouts175/t1_175_224/REVIEW_SUGGESTIONS_1/review_suggestions_1.tex
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- 1 This review sheet is not yet in final form. Stuff may be added to it.
- 2 Test #1 is on Friday, 2/24/06.

The test covers the material of assignments #1 - #12 and #__.

The test covers the material we have done in section 5.5 and chapters 6 and 7.

- 3 We need to be able to interpret definite integrals in terms of areas. Among other things, this helps to detect shortcuts and simplifications owing to symmetries.
- 4 MATH-147 topics which have come up:
 - (a) Circle equations
 - (b) Laws of Exponents
 - (c) Laws of Logarithms
 - (d) Pythagorean Identities involving squares of sines, cosines, tangents, and secants.
 - (e) Expressing squares of sines and cosines of θ in terms of functions of 2θ .
 - (f) Hyperbolic functions of x in terms of e^x .
 - (g) Hyperbolic Pythagorean identities
 - (h) The 30-60-90 and 45-45-90 facts produced around the unit circle (click here) so as to avoid embarrassment upon encounters such as

$$\int_{-\pi/3}^{5\pi/6} \sin(8\varphi) d\varphi.$$

- (i) Know the nice x -values for which $\arcsin(x)$, $\arccos(x)$, and $\arctan(x)$ yield nice clock-face values.
- (j) When an antiderivative-only problem requires a trigonometric substitution, you will have to evaluate expressions such as

$$\sin(2 \arctan(3x)) \quad \cos(2 \arcsin(x/5))$$

in terms of sums, differences, products, quotients, squares and square roots (no trig functions visible!).

5 Computations and methods to know:

- (a) How to make the transformation

$$\int_a^b f(x) dx = \int_A^B h(u) du$$

by means of a substitution of form $u = g(x)$ (note the “New-Limits” aspect).

- (b) How to make the transformation

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by means of a substitution of form $x = g(u)$ (note the “New-Limits” aspect). This shows up when we do trigonometric substitutions.

- (c) Application of the Integration-by-Parts method, especially in case of inverse functions.
- (d) Some problems will want you to set up an integral which answers the given problem. *BUT* not to evaluate the integral. All you have to do is make sure the integral is all there (with correct limits). This might happen in problems wanting
- (i) The area between two curves.
 - (ii) The volume of a solid with a given crosssection.
 - (iii) The volume of a solid of revolution about some axis or other.
 - (iv) The work done in some situation.

All such problems require non-microscopic diagrams showing the slices used and the genesis of the integrand.

- (e) Recognize when a trigonometric substitution makes sense. For instance, when the integrand involves something like $\sqrt{49 + 16x^2}$.
- (f) Recognize when a partial-fractions decomposition makes sense.
- (g) Be able to use the formulas for M_n , T_n , and S_n appropriately to approximate integrals.
- (h) Know how to convert improper integrals into limits of “proper” integrals.