MATH 2072 EXAM 1 REVIEW
EXAM 1 WILL BE ON MONDAY, 6/20/05

* Bring a calculator and something to write with.

Section 6.2  Be able to find the volume of a solid using the “slicing” method. Sometimes the solids will be described by rotating a region of the $xy$-plane about a horizontal or vertical line. Other problems describe a solid that you must position in the $xy$-plane.

Section 6.3  Use the “cylindrical shells” method to find the volume of a solid. You may be given a solid in which only one of these two methods work.

Section 6.4  We began this section by defining force and work in the case where force is constant. You should be able to work problems using metric ($m, \text{ kg}, N, J, \ldots$) or standard ($ft, \text{ lbs}, \ldots$) measurements, but you will not be asked to convert between the two. Work was also defined when force can be described along a straight line by a continuous function $f(x)$. Hooke’s Law gave a nice application of such a function. Be able to work problems similar to the homework, including the “tank” problems.

Section 7.1  Integration by parts was introduced in this section. Be familiar with the examples that were covered in class. In particular, some examples used integration by parts more than once, some used integration by parts along with the substitution rule, and others gave a reduction formula for the given integral.

Section 7.2  Be able to evaluate integrals of the forms

$$\int \sin^m x \cos^n x \, dx, \quad \int \tan^m x \sec^n x \, dx,$$

$$\int \sin(mx) \cos(nx) \, dx, \quad \int \sin(mx) \sin(nx) \, dx, \quad \text{and} \quad \int \cos(mx) \cos(nx) \, dx.$$

All trigonometric identities will be given to you, you just need to be able to apply them correctly.

Section 7.3  Evaluate integrals involving trigonometric substitution. Such integrals include expressions of the form $\sqrt{a^2 - x^2}$, $\sqrt{a^2 + x^2}$, or $\sqrt{x^2 - a^2}$. Before using trigonometric substitution, always see if regular substitution would work first.

Section 7.4  In this section, we described methods for integrating rational functions. If a rational function is improper, first apply the division algorithm to express it in terms of its quotient and a proper rational function. A proper rational function can usually be integrated after being expanded as partial fractions. We also looked at the case where an integrand contains a radical and can be rationalized.

Section 7.7  Approximate integration using the Midpoint Rule, Trapezoidal Rule, and Simpson’s Rule.
Section 7.8  Two types of improper integrals were defined. Be able to determine when such integrals are convergent or divergent and when they do converge, evaluate them. The comparison Theorem gave us a way of comparing improper integrals to determine convergence or divergence.

Section 8.1  Given a smooth function $y = f(x)$ ($f'$ is continuous), find the length of the curve over the interval $a \leq x \leq b$:

$$\text{Arc Length} = \int_{a}^{b} \sqrt{1 + (f'(x))^2} \, dx.$$ 

Of course, the roles of $x$ and $y$ may be switched. One can also define the arc length function $s(x)$ by

$$s(x) = \int_{a}^{x} \sqrt{1 + (f'(t))^2} \, dt$$

and use it to find the arc length from $(a, f(a))$ to some other point $(x, f(x))$.

Section 8.2  Find the area of a surface of revolution. If a curve is rotated about the $x$-axis, use the form $\int 2\pi y \, ds$ and if it is rotated about the $y$-axis, use the form $\int 2\pi x \, ds$. If the curve is defined by $y = f(x)$, where $f$ is smooth and defined for $a \leq x \leq b$, then the bounds of integration are $a$ and $b$ and

$$ds = \sqrt{1 + (f'(x))^2} \, dx.$$ 

If the curve is defined by $x = g(y)$, where $g$ is smooth and defined for $c \leq y \leq d$, the bounds of integration are $c$ and $d$ and

$$ds = \sqrt{1 + (g'(y))^2} \, dy.$$ 

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Other In addition to the previous topics, you should be able to work the examples covered in class as well as the assigned homework problems listed below.

ASSIGNED HOMEWORK PROBLEMS

Section 6.2  # 3, 5, 9, 13, 17, 28, 33, 41, 48, 54, 56
Section 6.3  # 5, 8, 13, 15, 17, 29, 38, 40, 42
Section 6.4  # 2, 8, 9, 12, 14, 19, 21
Section 7.1  # 5, 9, 11, 15, 19, 21, 25, 27, 36, 42, 46, 50, 57, 59, 61, 63
Section 7.2  # 3, 5, 7, 11, 13, 17, 25, 27, 33, 37, 41, 43, 48, 68
Section 7.3  # 3, 5, 7, 9, 13, 16, 17, 23
Section 7.4  # 5, 9, 11, 19, 23, 29, 33, 39, 41, 47, 49, 53, 55
Section 7.7  # 3, 12, 21(a), 32, 47
Section 7.8  # 1, 5, 7, 10, 13, 15, 18, 21, 27, 31, 37, 41, 49, 55, 61
Section 8.1  # 6, 9, 10, 15, 31
Section 8.2  # 1, 6, 7, 13, 14, 25