Formula Sheet Provided
(Will adjust integration tables based on provided questions)

Established integration formulas

$$\int \tan\theta \; d\theta = \ln|\sec\theta| + C \qquad \int \sec\theta \; d\theta = \ln|\sec\theta + \tan\theta| + C$$

$$\int \cot\theta \; d\theta = \ln|\sin\theta| + C \qquad \int \csc\theta \, d\theta = \ln|\csc\theta - \cot\theta| + C$$

$$\int \frac{dx}{x^2 + a^2} = \frac{1}{a}\tan^{-1}\left(\frac{x}{a}\right) + C \qquad \int \sec^3\theta \; d\theta = \frac{1}{2}\sec\theta\tan\theta + \frac{1}{2}\ln|\sec\theta + \tan\theta| + C$$

Trig Identities

$$\sin^2\theta = \frac{1}{2}(1 - \cos 2\theta) \qquad \cos^2\theta = \frac{1}{2}(1 + \cos 2\theta) \qquad \tan^2\theta = \frac{1 - \cos 2\theta}{1 + \cos 2\theta}$$

$$\sin 2A = 2\sin A\cos A \qquad \cos 2A = \cos^2 A - \sin^2 A \qquad \tan 2A = \frac{2\tan A}{1 - \tan^2 A}$$

$$\cos^2 x + \sin^2 x = 1 \qquad \sec^2 x = 1 + \tan^2 x \qquad \cot^2 x + 1 = \csc^2 x$$

Integrals of the form $\int \sin^m x \cos^n x \, dx$.

$\int \sin^m x \cos^n x \, dx$	Procedure
n odd	1. Split off a factor of $\cos x$. 2. Apply the relevant identity. 3. Make the substitution $u = \sin x$
m odd	1. Split off a factor of $\sin x$. 2. Apply the relevant identity. 3. Make the substitution $u = \cos x$
m even and n even	Use the relevant identities to reduce the powers on $\sin x$ and $\cos x$.

Integrals of the form $\int \tan^m x \sec^n x \, dx$.

$\int \tan^m x \sec^n x \, dx$	Procedure
n even	1. Split off a factor of $\sec^2 x$. 2. Apply the relevant identity. (all in terms of tan) 3. Make the substitution $u = \tan x$
m odd	1. Split off a factor of $\sec x \tan x$. 2. Apply the relevant identity. (all in terms of sec) 3. Make the substitution $u = \sec x$
m even and n odd	Use the relevant identities to reduce to powers of $\sec x$ alone. Then use integration by parts as in Example 8, page 475.

Expression in the integrand	*Substitution*
$\sqrt{a^2 - x^2}$	$x = a\sin\theta$
$\sqrt{x^2 + a^2}$	$x = a\tan\theta$
$\sqrt{x^2 - a^2}$	$x = a\sec\theta$

Math 151 **Practice Questions Exam #1 (Chapter 5)**

Here are some practice questions to test yourself on the Chapter 5 material. The actual exam will not be quite this extensive. You may be given the option to skip a question of your choosing.

1. Evaluate the following integrals.

   A. $\int_0^{\sqrt{\pi}} 6t\cos(t^2)\ dt$

   B. $\int x(3x+1)^5\ dx$

   C. $\int \frac{e^x}{e^x-4}\ dx$

2. Evaluate the following integrals.

   A. $\int_1^{81} \sqrt{4x}\ln x\ dx$

   B. $\int \frac{2}{3x^2\sqrt{x^2-16}}\ dx$

   C. $\int_0^{\frac{\pi}{3}} \sin^3\theta - \sin^5\theta\ d\theta$

   D. $\int \frac{-3x^2+5x-12}{x^3+4x} dx$

   E. $\int \sqrt{3-2x-x^2}\,dx$

   F. $\int_0^{\sqrt{8}} \frac{3x^3}{\sqrt{1+x^2}} dx$

   G. $\int_0^4 (x^2+1)e^{-x}\ dx$

3. Find the area bounded by the curves $y=\cos x$ and $y=\cos^2 x$ between $x=\frac{3\pi}{2}$ and $x=2\pi$.

4. Evaluate the following improper integrals to determine whether they converge or diverge.

   A. $\int_2^{\infty} \frac{2\ln x}{x^2}\ dx$

   B. $\int_0^1 \frac{1}{2x-1} dx$

   C. $\int_5^{\infty} \frac{8}{x^2} dx$

   D. $\int_{-5}^{5} \frac{8}{x^2} dx$

   E. $\int_4^{\infty} \frac{3}{\sqrt{x}} dx$

   F. $\int_0^4 \frac{3}{\sqrt{x}} dx$