MAC2312 Test 2 Summer 2007 Name Key
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1. Select the appropriate method to integrate $\int \frac{5x^3}{\sqrt{1+x^2}} dx$.

A. Partial fractions
B. U substitution
C. Trig substitution
D. Trig identity
E. Integration by parts
F. Long division

2. Select the appropriate method to integrate $\int \sin(5x) dx$.

A. Partial fractions
B. U substitution
C. Trig substitution
D. Trig identity
E. Integration by parts
F. Long division

3. Select the appropriate method to integrate $\int \frac{3x+1}{x-2} dx$.

A. Partial fractions
B. U substitution
C. Trig substitution
D. Trig identity
E. Integration by parts
F. Long division

4. Select the appropriate method to integrate $\int \sin^4 x \cos^6 x dx$.

A. Partial fractions
B. U substitution
C. Trig substitution
D. Trig identity
E. Integration by parts
F. Long division

5 Select the appropriate method to integrate $\int \frac{1}{(x+3)(x-2)}dx$.

A. Partial fractions
B. U substitution
C. Trig substitution
D. Trig identity
E. Integration by parts
F. Long division

6. Select the appropriate method to integrate $\int x^2 \cos x dx$.

A. Partial fractions
B. U substitution
C. Trig substitution
D. Trig identity
E. Integration by parts
F. Long division

Choose 5 of the following 7 problems to integrate on your own paper. Clearly mark the 5 problems chosen to be graded. Show all work for credit.

$\int \frac{x}{\sqrt{1-x^2}}dx$

$\int \frac{\sqrt{\arctan x}}{1+x^2}dx$

$\int \frac{3x+2}{x^2-9}dx$

$\int \cot x \ln(\sin x)dx$

$\int x \cos x dx$

$\int \frac{x^2}{x+4}dx$

$\int \cos^2 x \tan^2 x dx$

$$\int \frac{x}{\sqrt{1-x^2}}\,dx \qquad u = 1-x^2$$

$$du = -2x\,dx$$

$$\frac{du}{-2} = x\,dx$$

$$\int \frac{1}{\sqrt{u}}\,\frac{du}{-2} = -\frac{1}{2}\int u^{-1/2}\,du = -\frac{1}{2}\,u^{1/2}\cdot\frac{2}{1} = -u^{1/2} = \boxed{-\sqrt{1-x^2}+C}$$

$$\int \frac{3x+2}{x^2-9}\,dx = \int\left[\frac{A}{(x+3)}+\frac{B}{(x-3)}\right]dx = A\ln|x+3| + B\ln|x-3|$$

$$A(x-3) = Ax-3A$$

$$B(x+3) = Bx+3B$$

$$3x+2$$

$$\begin{cases} A+B=3 \\ -3A+3B=2 \end{cases} \Rightarrow \begin{array}{r} 3A+3B=9 \\ -3A+3B=2 \\ \hline 6B=11 \\ B=11/6 \end{array} \qquad \begin{array}{l} A+\frac{11}{6}=\frac{18}{6} \\ A=7/6 \end{array}$$

$$= \boxed{\frac{7}{6}\ln|x+3| + \frac{11}{6}\ln|x-3| + C}$$

$$uv - \int v\,du$$

$$\int x\cos x\,dx = x\sin x - \int \sin x\,dx = \boxed{x\sin x + \cos x + C}$$

$$u = x \qquad v = \sin x$$

$$du = dx \qquad dv = \cos x\,dx$$

$$\int \cos^2 x \tan^2 x\,dx = \int \cos^2 x\cdot\frac{\sin^2 x}{\cos^2 x}\,dx = \int \sin^2 x\,dx$$

$$= \int\left(\frac{1}{2}-\frac{1}{2}\cos 2x\right)dx = \frac{1}{2}x - \frac{1}{2}\,\frac{\sin 2x}{2} = \boxed{\frac{1}{2}x - \frac{1}{4}\sin 2x + C}$$

$$\int \frac{\sqrt{\arctan x}}{1+x^2}\,dx \qquad u = \arctan x$$

$$du = \frac{1}{1+x^2}\,dx$$

$$\int \sqrt{u}\,du = u^{3/2}\cdot\frac{2}{3} = \boxed{\frac{2}{3}(\arctan x)^{3/2} + C}$$

$$\int \cot x \ln(\sin x)\,dx = \int u\,du = \frac{u^2}{2} = \boxed{\frac{1}{2}[\ln(\sin x)]^2 + C}$$

$u = \ln(\sin x)$

$du = \frac{1}{\sin x} \cdot \cos x\,dx$

$du = \cot x\,dx$

$$\int \frac{x^2}{x+4}\,dx = \int \left(x - 4 + \frac{16}{x+4}\right)dx = \boxed{\frac{x^2}{2} - 4x + 16\ln|x+4| + C}$$

$$\begin{array}{r|l} x+4 & x^2 \\ & -x^2+4x \\ \hline & -4x \\ & +4x+16 \\ \hline & 16 \end{array}$$

$x - 4 + \frac{16}{x+4}$