ADDITIONAL PRACTICE
FOR
POWERS OF SINE AND COSINE

Case I

1. $\int \cos^3 x \sin^2 x dx$

2. $\int \sin^5 2x \cos 2x dx$

3. $\int_0^{\frac{\pi}{2}} \cos^5 x dx$

Case II

4. $\int_0^{\frac{\pi}{2}} \cos^2 x dx$

5. $\int_{-\pi}^{\pi} \sin^2 x dx$

6. $\int_0^{\frac{\pi}{2}} \cos^4 x dx$

Case III

7. $\int \sin 3x \cos 2x dx$

8. $\int \cos 3x \cos 2x dx$

9. $\int_0^{\frac{\pi}{4}} \sin 2\theta \sin 3\theta d\theta$

Wallis' Formula states that

1. If n is odd $(n \geq 3)$ then

$$\int_0^{\frac{\pi}{2}} \cos^n x dx = \left(\frac{2}{3} \cdot \frac{4}{5} \cdot \frac{6}{7} \cdot \ldots \cdot \frac{n-1}{n}\right)$$

2. If n is even $(n \geq 2)$ then

$$\int_0^{\frac{\pi}{2}} \cos^n x dx = \left(\frac{1}{2} \cdot \frac{3}{4} \cdot \frac{5}{6} \cdot \ldots \cdot \frac{n-1}{n} \cdot \frac{\pi}{2}\right)$$

John Wallis (1616-1703)
He did much of his work on calculus prior to Newton and Leibniz, influencing the thinking of both of them. He is credited with introducing the symbol (∞) for infinity.

Extension:
Verify Wallis' Formula by analyzing your answers to questions 3, 4, and 6 above.