

SKILLS CHECK 2  
MATH 202 and MATH 202 Honors

This is a take home assignment. You may use your instructor to aid you in finding the following antiderivatives. Any other help is expressly forbidden. The assignment is due on Wednesday, February 13 at 3:30 p.m. in Bancroft 158. **You must show your work to get credit. Please take care to make your work legible. Use a separate side of a piece of paper for each antiderivative.**

1.  $\int x e^{3x} dx$

9.  $\int \ln(x^2 + 1) dx$

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

10.  $\int \tan^5 x \sec^4 x dx$

3.  $\int \frac{dx}{x^2 \sqrt{36 - x^2}}$

11.  $\int \frac{x^2}{\sqrt{x^2 - 4}} dx$

4.  $\int \frac{3x - 1}{x^2 + x - 2} dx$

12.  $\int \frac{4x^2 + 8}{(x - 2)(x^2 + 4)} dx$

5.  $\int x^2 \ln(3x) dx$

13.  $\int x \sin^{-1} x dx$

6.  $\int \sin^4 x \cos^2 x dx$

14.  $\int x \sqrt{7 - 6x - x^2} dx$

7.  $\int \sqrt{16 + 5x^2} dx$

15.  $\int \frac{x^3}{x^2 + x - 12} dx$

8.  $\int \frac{1}{(x + 1)^2(x - 2)} dx$

16.  $\int \frac{x}{\sqrt{1 - x^4}} dx$

## SOME POTENTIALLY HELPFUL IDENTITIES AND FORMULAS

### Trigonometric Identities

- $\sin(\alpha + \beta) = \sin \alpha \cos \beta + \cos \alpha \sin \beta$
- $\sin(\alpha - \beta) = \sin \alpha \cos \beta - \cos \alpha \sin \beta$
- $\cos(\alpha + \beta) = \cos \alpha \cos \beta - \sin \alpha \sin \beta$
- $\cos(\alpha - \beta) = \cos \alpha \cos \beta + \sin \alpha \sin \beta$
- $\sin \alpha \cos \beta = \frac{1}{2}(\sin(\alpha - \beta) + \sin(\alpha + \beta))$
- $\sin \alpha \sin \beta = \frac{1}{2}(\cos(\alpha - \beta) - \cos(\alpha + \beta))$
- $\cos \alpha \cos \beta = \frac{1}{2}(\cos(\alpha - \beta) + \cos(\alpha + \beta))$
- $\sin 2\alpha = 2 \sin \alpha \cos \alpha$
- $\cos 2\alpha = \cos^2 \alpha - \sin^2 \alpha = 2 \cos^2 \alpha - 1 = 1 - 2 \sin^2 \alpha$
- $\sin^2 \alpha = \frac{1 - \cos 2\alpha}{2}$
- $\cos^2 \alpha = \frac{1 + \cos 2\alpha}{2}$

### Antiderivatives:

- $\int \tan x = \ln |\sec x| + C = -\ln |\cos x| + C$
- $\int \cot x = -\ln |\csc x| + C = \ln |\sin x| + C$
- $\int \sec x = \ln |\sec x + \tan x| + C$
- $\int \csc x = \ln |\csc x - \cot x| + C$
- $\int \frac{dx}{\sqrt{a^2 - x^2}} = \sin^{-1} \frac{x}{a} + C$
- $\int \frac{dx}{a^2 + x^2} = \frac{1}{a} \tan^{-1} \frac{x}{a} + C$
- $\int \frac{dx}{x\sqrt{x^2 - a^2}} = \frac{1}{a} \sec^{-1} \left| \frac{x}{a} \right| + C$
- $\int \sec^3 x = \frac{1}{2} \sec x \tan x + \frac{1}{2} \ln |\sec x + \tan x| + C$