

Math 2320 - Integration Worksheet

1 U-Substitution

1. $\int (1 - x^2)^{-3} x \, dx$
2. $\int 2^x \, dx$ Hint: $2^x = (e^{\ln(2)})^x = e^{x \ln(2)}$
3. $\int 5e^2 x - 4 \cos(3x) + 7 \sin(4x) \, dx$

2 By Parts

1. $\int x e^{2x} \, dx$
2. $\int \ln(x) \, dx$
3. $\int x^3 e^x \, dx$
4. $\int x^2 \sin(x) \, dx$
5. $\int \tan^{-1}(x) \, dx$
6. $\int \sec^3(x) \, dx$ Hint: there are two steps first integrate by parts using $u = \sec(x)$ and $dv = \sec^2(x) \, dx$, and then next use the identity $\tan^2(x) = \sec^2(x) - 1$. Now look at your work. The answer is there.

3 Trigonometric Integrals

1. $\int \sin^4(3x) \cos(3x) \, dx$
2. $\int \sin^5(3x) \cos^2(3x) \, dx$
3. $\int \sin^4(x) \, dx$

4. $\int \sec(x) dx$

5. $\int \tan(x) dx$

4 Trigonometric Substitution

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

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

3. $\int \frac{1}{(3x^2-4)^{3/2}} dx$

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

5. $\int \frac{1}{(3x^2-4)^{5/2}} dx$ Hint: use the work from problem 6 in Section 2 to help.

6. $\int \frac{1}{4x^2-9} dx$

7. $\int \frac{1}{x^2+2x} dx$

Trigonometric Integrals: $\int \sin^n(x) \cos^m(x) dx$

at least one of n,m is a positive odd	$\sin^2(\theta) = 1 - \cos^2(\theta)$ and $\cos^2(\theta) = 1 - \sin^2(\theta)$
n,m both even and positive	$\sin^2(\theta) = \frac{1}{2}[1 - \cos(2\theta)]$ and $\cos^2(\theta) = \frac{1}{2}[1 + \cos(2\theta)]$

Trigonometric Substitution:

$a^2 - u^2$	$u = a \sin(\theta)$	$\cos^2(\theta) = 1 - \sin^2(\theta)$
$a^2 + u^2$	$u = a \tan(\theta)$	$\sec^2(\theta) = 1 + \tan^2(\theta)$
$u^2 - a^2$	$u = a \sec(\theta)$	$\tan^2(\theta) = \sec^2(\theta) - 1$