

MATH2260 - Calculus II for Science and Engineering

Assignment 1 - Due Wednesday September 6, 2017

1 Integrals

Evaluate the following using the techniques covered in class:

$$\text{a) } \int_0^3 (x^2 + 2x + 1)e^x dx \quad \text{b) } \int \frac{1}{e^s - 1} ds \quad \text{c) } \int \tan^3(\theta) d\theta \quad \text{d) } \int \frac{\sqrt{1-v^2}}{v^2} dv$$

$$\text{e) } \int \frac{2x+1}{x^2(9x^2+4)} dx \quad \text{f) } \int_{-\frac{\pi}{4}}^{\pi} \sin^3(r) \cos^3(r) dr \quad \text{g) } \int \frac{w^3+1}{w^3-1} dw \quad \text{h) } \int \arctan(3r) dr$$

$$\text{i) } \int \cos^2(x) \sin^2(x) \cos(2x) dx \quad \text{j) } \int e^{3r} \sin(4r) dr$$

2 Trigonometric Power Reduction - Integration by Parts

a) In class, we noticed that integrals of the form

$$\int \sin^n x \cos^m x dx, \text{ where both } n \text{ and } m \text{ are even} \quad (1)$$

can be evaluated using double angle formulas.

A power reduction formula represents an alternate method of solution.

Using integration by parts, establish the following relationship:

$$\int \sin^n(x) dx = -\frac{1}{n} \cos(x) \sin^{n-1}(x) + \frac{n-1}{n} \int \sin^{n-2}(x) dx \quad (2)$$

Why is the result in (2) enough to evaluate all integrals of the form (1)?

b) Using the result in (2), evaluate the following:

$$\text{i) } \int \sin^2(x) dx \quad \text{ii) } \int \sin^4(x) dx \quad \text{iii) } \int \cos^4(x) \sin^2(x) dx \quad \text{iv) } \int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} \cos^4(x) \sin^4(x) dx$$