

CALCULUS II Second Semester Question Bank

Homework of Lecture 1

1. In the following Exercises, find the most general anti-derivative or indefinite integral.

a. $\int x^4(x + 2x) dx$

b. $\int (\sqrt{2x} + \sqrt[5]{x}) dx$

c. $\int -\left(\frac{\sec^2 x}{3}\right) dx$

d. $\int \frac{\csc \theta \cot \theta}{2} d\theta$

e. $\int (4 \sec x \tan x - 2 \sec^2 x) dx$

f. $\int \frac{1}{2} (\csc^2 x - \csc x \cot x) dx$

g. $\int \cos x (\tan x + \sec x) dx$

h. $\int \frac{\csc x}{\csc x - \sin x} dx$

i. $\int (1 + \tan^2 x) dx$ (Hint $(1 + \tan^2 x) = \sec^2 x$)

j. $\int (2 + \tan^2 x) dx$

k. $\int \frac{1}{t^2} \cos\left(\frac{1}{t} - 1\right) dt$

2. Find the indefinite integral?

a. $\int 4x^3 \sin x^4 dx$

b. $\int \frac{1}{\theta^2} \sin \frac{1}{\theta} \cos \frac{1}{\theta} d\theta$

c. $\int \sqrt{\cot y} \csc^2 y dy$

d. $\int \frac{\sec z \tan z dz}{\sqrt{\sec z}}$

e. $\int \csc^2 2x \cot 2x dx$

f. $\int \frac{\sin x}{\cos^3 x} dx$

g. $\int \cot^2 x dx$ Hint $(1 + \cot^2) = \csc^2 x$

3. Evaluate the integral of the following integrations indicated below

a. $\int (e^{2x} + 5e^{-3x}) dx$

b. $\int 8 e^{(x+1)} dx$

c. $\int \frac{e^{\sqrt{r}}}{\sqrt{r}} dr$

d. $\int t^3 e^{t^4} dt$

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

f. $\int e^{\sec \pi t} \sec \pi t \tan \pi t dt$

g. $\int \frac{dx}{1 + e^x}$

4. Evaluate the following integrations?

a. $\int (1.3)^x dx$

b. $\int 4 x^{\sqrt{4}} dx$

c. $\int \frac{dx}{x \log_{10} x}$

Homework of L 2

1. Evaluate the following integrals?

$$a) \int \frac{dx}{\sqrt{9-x^2}}$$

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

$$c) \int \frac{dx}{x\sqrt{5x^2-4}}$$

$$d) \int \frac{e^{\sin^{-1}x} dx}{\sqrt{1-x^2}}$$

$$e) \int \frac{(\sin^{-1}x)^2 dx}{\sqrt{1-x^2}}$$

$$f) \int \frac{dy}{(\tan^{-1}x)(1+y^2)}$$

2. Evaluate the integrals?

$$a) \int \sinh \frac{4x}{9} dx$$

$$b) \int \tanh \frac{2x}{7} dx$$

$$c) \int \operatorname{sech}^2 \left(1 - \frac{1}{2}\right) dx$$

$$d) \int \coth \frac{\theta}{\sqrt{3}} d\theta$$

$$e) \int e^x \sec^2(e^x - 7) dx$$

$$f) \int (\sec^2 x) e^{\tan x} dx$$

$$g) \int \frac{\operatorname{sech} \sqrt{t} \tanh \sqrt{t} dt}{\sqrt{t}}$$

$$H) \int \frac{1}{y\sqrt{4y^2-1}} dy$$

$$I) \frac{24}{y\sqrt{y^2-16}} dy$$

3. Solve the following Integrations?

$$a) \int \frac{dx}{x\sqrt{1+(\ln x)^2}}$$

$$b) \int \frac{\csc^2 x dx}{1+(\cot x)^2}$$

Homework of Lecture 3

1. Evaluate each integral by using a substitution to reduce it to standard form:

$$\begin{array}{lll} a) \int \cot^3 y \csc^2 y \, dy & b) \int \frac{dx}{\sqrt{2x-x^2}} & c) \int (\csc x - \tan x)^2 \, dx \\ d) \int \frac{x^2}{x^2+1} \, dx & e) \int \frac{1-x}{\sqrt{1-x^2}} \, dx & f) \int \frac{1}{\csc \theta + \cot \theta} \, d\theta \end{array}$$

2. Integration by part:

$$\begin{array}{lll} a) \int x \sec^2 x \, dx & b) \int (x+1)^2 e^x \, dx & c) \int e^\theta \cos 2\theta \, d\theta \\ d) \int x^2 \ln x \, dx \end{array}$$

3. Trigonometric Integrals:

$$a) \int_0^{\frac{\pi}{2}} \sin^5 x \, dx \quad b) \int_0^{\frac{\pi}{4}} \sec^4 \theta \, d\theta \quad c) \int \tan^4 x \sec^2 x \, dx$$

4. Basic Trigonometric Substitutions:

$$a) \int \sqrt{1-9t^2} \, dt \quad b) \int \frac{dx}{x^2 \sqrt{x^2+1}}$$

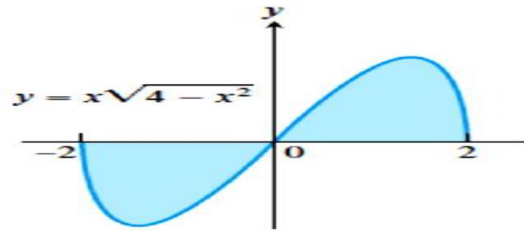
5. Suppose that f and g are integral and that:

$$\int_1^2 f(x) \, dx = -4, \quad \int_1^5 f(x) \, dx = 6, \quad \int_1^5 g(x) \, dx = 8$$

Use the rules of definite integrals to find:

$$\begin{array}{llll} a. \int_2^2 g(x) \, dx & b. \int_5^1 g(x) \, dx & c. \int_1^2 3 f(x) \, dx & d. \int_1^5 [f(x) \\ & - g(x)] \, dx \end{array}$$

6. Find the total area of shaded regions for the following graphs:



7. Find the following double integrals:

a. $\int_0^3 \int_{-x}^{x(2-x)} dx dy$ b. $\int_0^{\pi/4} \int_{\sin x}^{\cos x} dx dy$

8. Find the average value of $f(x, y) = \sin(x + y)$ over the rectangle $0 \leq x \leq \pi$, $0 \leq y \leq \pi$.

9. Evaluate $\int_0^1 \int_0^1 \int_0^1 (x^2 + y^2 + z^2) dz dy dx$.