

Instructor: Fred Khoury

1. Evaluate the following integrals.

a)  $\int \cos^2 \frac{t}{5} \sin^2 \frac{t}{5} dt$

b)  $\int \frac{x^2 + 2x - 2}{(x^3 + 3x^2 - 6x)^2} dx$

c)  $\int (\tan x)^{-3/2} \sec^2 x dx$

d)  $\int (2\theta + 1 + 2\cos(2\theta + 1)) d\theta$

e)  $\int \left( \frac{1}{\sqrt{2\theta - \pi}} + 2\sec^2(2\theta - \pi) \right) d\theta$

f)  $\int \frac{(t+1)^2 - 1}{t^4} dt$

g)  $\int \sec \theta \tan \theta \sqrt{1 + \sec \theta} d\theta$

h)  $\int e^t \cos(3e^t - 2) dt$

i)  $\int e^y \csc(e^y + 1) \cot(e^y + 1) dy$

j)  $\int (\csc^2 x) e^{\cot x} dx$

k)  $\int 2^{\tan x} \sec^2 x dx$

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

m)  $\int \frac{dx}{\sqrt{-x^2 + 4x - 1}}$

n)  $\int_{-1}^1 \frac{3dv}{4v^2 + 4v + 4}$

o)  $\int \frac{dt}{(3t + 1)\sqrt{9t^2 + 6t}}$

2. Evaluate the following integrals

a)  $\int_0^1 (4x^{21} - 2x^{16} + 1) dx$

b)  $\int_{1/2}^1 \sin\left(\frac{\pi}{2}x - \frac{\pi}{4}\right) dx$

c)  $\int_{-2}^2 (3x^4 - 2x + 1) dx$

d)  $\int_0^\pi (1 - \cos^2 3\theta) d\theta$

e)  $\int_0^1 \frac{6x}{(4 - x^2)^{3/2}} dx$

f)  $\int_1^4 \frac{(1 + \sqrt{u})^{1/2}}{\sqrt{u}} du$

g)  $\int_0^{1/2} x^3 (1 + 9x^4)^{-3/2} dx$

h)  $\int_{\pi^2/36}^{\pi^2/4} \frac{\cos \sqrt{t}}{\sqrt{t} \sin \sqrt{t}} dt$

i)  $\int_1^e \frac{\sqrt{\ln x}}{x} dx$

p)  $\int_{-\pi/2}^{\pi/6} \frac{\cos t}{1 - \sin t} dt$

q)  $\int_1^8 \left( \frac{2}{3x} - \frac{8}{x^2} \right) dx$

r)  $\int_0^{\ln 9} e^\theta (e^\theta - 1)^{1/2} d\theta$

j)  $\int_{-1/5}^{1/5} \frac{6dx}{\sqrt{4 - 25x^2}}$

3. Find the area of the region bounded by the graphs of

a)  $f(x) = 1 - \frac{x^2}{4}, \quad -2 \leq x \leq 3$

b)  $f(x) = 5 - 5x^{2/3}, \quad -1 \leq x \leq 8$

c)  $f(x) = 1 - \sqrt{x}, \quad 0 \leq x \leq 4$

## Answers

1.    *a)*  $\frac{1}{8}\left(t - \frac{5}{4}\sin\frac{4t}{5}\right) + C$       *b)*  $\frac{-1}{3(x^3 + 3x^2 - 6x)} + C$       *c)*  $\frac{-2}{(\tan x)^{1/2}} + C$
- d)*  $\theta^2 + \theta + \sin(2\theta + 1) + C$     *e)*  $(2\theta - \pi)^{1/2} + \tan(2\theta - \pi) + C$     *f)*  $-\frac{1}{t} - \frac{1}{t^2} + C$
- g)*  $\frac{2}{3}(1 + \sec\theta)^{3/2} + C$       *h)*  $\frac{1}{3}\sin(3e^t - 2) + C$       *i)*  $-\csc(e^y + 1) + C$
- j)*  $-e^{\cot x} + C$       *k)*  $\frac{2^{\tan x}}{\ln 2} + C$       *l)*  $6\sec^{-1}\left|\frac{y}{4}\right| + C$
- m)*  $\sin^{-1}\left(\frac{x-2}{\sqrt{3}}\right) + C$       *n)*  $\frac{1}{3}\sec^{-1}|3t+1| + C$
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2.    *a)*  $\frac{199}{187}$       *b)*  $\frac{2-\sqrt{2}}{\pi}$       *c)*  $\frac{212}{5}$       *d)*  $\frac{\pi}{2}$       *e)*  $2\sqrt{3} - 3$
- f)*  $\frac{4}{3}(3\sqrt{3} - 2\sqrt{2})$     *g)*  $\frac{1}{90}$       *h)*  $2(2 - \sqrt{2})$     *i)*  $\frac{\sqrt{3}\pi}{4}$       *k)*  $\frac{2}{3}$
- l)*  $\ln 4$       *m)*  $\ln 4 - 7$     *n)*  $\frac{32\sqrt{2}}{3}$       *o)*  $\frac{2\pi}{5}$
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3.    *a)*  $\frac{13}{4}$       *b)* 62      *c)* 2