

ESP  
Kouba  
Worksheet 10

1.) Integrate.

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

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

c.)  $\int \frac{e^{2x}}{1+e^{2x}} dx$

d.)  $\int \frac{e^x}{1+e^{2x}} dx$

e.)  $\int \frac{1}{x(1+(\ln x)^2)} dx$

f.)  $\int \frac{\sec 3x \cdot \tan 3x}{1 + \sec^2 3x} dx$

g.)  $\int \frac{e^{2x}}{1+e^x} dx$

h.)  $\int \csc(1-2x) dx$

i.)  $\int \frac{\sec x}{\tan x} dx$

j.)  $\int \frac{\sec 3x \cdot \tan 3x}{\sec^2 3x - 1} dx$

k.)  $\int \sin x \cos x dx$

l.)  $\int \cos^3 x \cdot \sin x dx$

m.)  $\int \sin^2 x \cdot \cos^2 x dx$

n.)  $\int \cos^3 x dx$

o.)  $\int \tan 7x dx$

p.)  $\int \tan 7x \cdot \sec^2 7x dx$

q.)  $\int \tan^2 7x \cdot \sec^2 7x dx$

r.)  $\int \sec^4 x \cdot \tan x dx$

s.)  $\int \sec^5 x \cdot \tan^3 x dx$

t.)  $\int \tan^3 x dx$

u.)  $\int \sec^3 x dx$

v.)  $\int \frac{6x+12}{x^2+4x+7} dx$

w.)  $\int \frac{1}{x^2+4x+7} dx$

x.)  $\int \frac{x}{x^2+4x+7} dx$

$$y.) \int \frac{x^2}{x^2+4x+7} dx$$

$$z.) \int \frac{x^2+4x+7}{x^2} dx$$

$$A.) \int \frac{\sin \theta}{1+\cos \theta} d\theta$$

$$B.) \int \frac{1}{1+\cos \theta} d\theta$$

$$C.) \int \frac{1}{\sec \theta + 1} d\theta$$

$$D.) \int \frac{\sec \theta \cdot \tan \theta}{\sec \theta + 1} d\theta$$

$$E.) \int \frac{1}{\tan \theta + 1} d\theta$$

$$F.) \int_{\frac{2\pi}{3}}^{\pi} \sqrt{\sec^2 \theta - 1} d\theta$$

2.) a.) Use the trapezoidal method with  $n=6$  to estimate  $\int_0^3 \frac{x}{1+x^4} dx$ .

b.) Use Simpson's method with  $n=6$  to estimate  $\int_0^3 \frac{x}{1+x^4} dx$ .

c.) Evaluate  $\int_0^3 \frac{x}{1+x^4} dx$ .

3.) Consider the definite integral  $\int_0^1 f(x) dx$ , where  $f(x) = e^{-x^2}$ .

a.) Compute  $f''(x)$  and  $f^{(4)}(x)$ .

b.) Determine good estimates for

$$M_2 = \max_{0 \leq x \leq 1} |f''(x)| \quad \text{and} \quad M_4 = \max_{0 \leq x \leq 1} |f^{(4)}(x)|.$$

c.) i.) What should  $n$  be in order that the trapezoidal method estimate  $\int_0^1 e^{-x^2} dx$  with an error of at most .00001?

ii.) What should  $n$  be in order that Simpson's method estimate  $\int_0^1 e^{-x^2} dx$  with an error of at most .00001?

4.) What is the value of the following continued fraction?

$$2 + \frac{2}{2 + \frac{2}{2 + \frac{2}{2 + \frac{2}{2 + \dots}}}}$$