

Quiz 4 will cover the following material: (all handouts posted on the web site so far)

1. All material for Quizzes 1-3
2. Differentiate any function, including logarithmic, exponential, and inverse trigonometric functions.
3. Apply the fundamental theorem to compute definite integrals and differentiate functions defined using definite integrals.
4. Graph trigonometric functions (all 12 of them) and state their basic properties, differentiate them and integrate them. (Exception: we did not yet integrate $\sec^{-1} x$ and $\csc^{-1} x$, so you don't need to know those.)
5. Integrate using substitution, trigonometric substitution, integration by parts, and partial fractions with linear factors. Integrate trigonometric and inverse trigonometric functions.
6. Approximate logarithmic expressions using the definition of $\ln x$ as $\int_1^x \frac{1}{t} dt$.

Sample Quiz 4

1. Compute $\frac{dy}{dx}$ if $y = \int_1^{\sec x} \frac{1}{\sqrt[4]{1+e^{2t}}} dt$

2. Compute each of the following integrals.

a) $\int \frac{1}{(x+1)(x-1)} dx$

i) $\int \frac{x}{\sqrt{4x^2-9}} dx$

p) $\int_0^{\pi} \sqrt{1+\cos x} dx$

b) $\int \frac{x}{(x+1)(x-1)} dx$

j) $\int_1^2 x\sqrt{x-1} dx$

q) $\int_0^{\pi/4} \tan^2 x dx$

c) $\int \frac{x^2}{(x+1)(x-1)} dx$

k) $\int_2^3 \frac{1}{x^2-1} dx$

r) $\int \sec^3 x \tan^3 x dx$

d) $\int \frac{5}{x^2+x} dx$

l) $\int \frac{\arctan x}{1+x^2} dx$

s) $\int \frac{e^x}{e^x+1} dx$

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

m) $\int x^2 \cos(2x) dx$

t) $\int xe^{-x} dx$

f) $\int \frac{\sin 2x}{1+\cos 2x} dx$

n) $\int \frac{1}{\sqrt{9x^2-25}} dx$

u) $\int \sin 2x \sin 10x dx$

g) $\int \sec^3 x dx$

o) $\int_0^2 \frac{1}{\sqrt{4-x^2}} dx$

v) $\int x^4 \ln x dx$

h) $\int \frac{1}{\sqrt{4x^2-9}} dx$

Answers

1. $\frac{\sec x \tan x}{\sqrt[4]{1 + e^{2 \sec x}}}$

2. a) $\frac{1}{2} \ln |x - 1| - \frac{1}{2} \ln |x + 1| + C$ b) $\frac{1}{2} \ln |x^2 - 1| + C$ c) $x + \frac{1}{2} \ln |x - 1| - \frac{1}{2} \ln |x + 1| + C$

d) $5 \ln |x| - 5 \ln |x + 1| + C$ e) $\arctan |x + 1| + C$ f) $-\frac{1}{2} \ln |\cos 2x + 1| + C$

g) $\frac{1}{2} (\sec x \tan x + \ln |\sec x + \tan x|) + C$ h) $\frac{1}{2} \ln |2x + \sqrt{4x^2 - 9}| + C$ i) $\frac{1}{4} \sqrt{4x^2 - 9} + C$

j) $\frac{16}{15}$ k) $-\frac{1}{2} \ln 2 + \frac{1}{2} \ln 3$ l) $\frac{1}{2} \arctan^2 x + C$ m) $\frac{1}{2} x \cos 2x - \frac{1}{4} \sin 2x + \frac{1}{2} x^2 \sin 2x + C$

n) $\frac{1}{3} \ln |18x + 6\sqrt{9x^2 - 25}| + C$ o) $\frac{\pi}{2}$ p) $2\sqrt{2}$ q) $1 - \frac{\pi}{4}$ r) $\frac{1}{5} \sec^5 x - \frac{1}{3} \sec^3 x + C$

s) $\ln(e^x + 1) + C$ t) $-e^{-x} - xe^{-x} + C$ u) $\frac{1}{16} \sin 8x - \frac{1}{24} \sin 12x + C$ v) $\frac{1}{5} x^5 \ln x - \frac{1}{25} x^5 + C$