

Quiz 3 will cover the following material: (all handouts posted on the web site so far)

1. All material for Quizzes 1 and 2
2. Differentiate any function, including logarithmic, exponential, and inverse trigonometric functions.
3. Use implicit differentiation.
4. Apply the fundamental theorem to compute definite integrals and differentiate functions defined using definite integrals.
5. Integrate using substitution and integration by parts. Integrate trigonometric and inverse trigonometric functions.

### Sample Quiz 3

1. Differentiate each of the following:

a)  $f(x) = \cot x + \sec x$

b)  $m(x) = e^{\cos 5x}$

c)  $M(a) = \tan^{-1}(a^4)$

d)  $f(x) = \int_0^{x^4} \sqrt{t^2 + 1} dt$

2. Find  $y'$  using implicit differentiation in  $x^3 + y^3 = \sin(xy)$

3. Compute each of the following integrals.

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

c)  $\int \tan^{-1} x dx$

e)  $\int \csc x dx$

b)  $\int \frac{1}{x^2 + 3} dx$

d)  $\int e^x \cos x dx$

f)  $\int_1^e x^3 \ln x dx$

### Answers

1. a)  $f'(x) = -\cot^2 x - 1 + \sec x \tan x$     b)  $m'(x) = -5(\sin 5x)e^{\cos 5x}$     c)  $M'(a) = \frac{4a^3}{a^8 + 1}$

d)  $f'(x) = 4x^3 \sqrt{x^8 + 1}$

2.  $y' = \frac{y \cos xy - 3x^2}{-x \cos xy + 3y^2} = \frac{-y \cos xy + 3x^2}{x \cos xy - 3y^2}$

3. a)  $\frac{1}{2} \ln(x^2 + 3) + C$     b)  $\frac{1}{\sqrt{3}} \arctan\left(\frac{x}{\sqrt{3}}\right) + C$     c)  $x \tan^{-1} x - \frac{1}{2} \ln(x^2 + 1) + C$

d)  $\frac{1}{2} e^x (\sin x + \cos x) + C$

e)  $-\ln|\csc x + \cot x| + C$

f)  $\frac{3}{16} e^4 + \frac{1}{16}$