

Math 111-002  
Assignment # 4

1. Differentiate the function. Simplify where possible.

(a)  $f(t) = \frac{e^t}{t^2 + 1}$

(b)  $f(x) = e^x \ln x$

(c)  $g(u) = \frac{e^u + e^{-u}}{e^u - e^{-u}}$

(d)  $h(s) = \sqrt{1 + se^{-s}}$

(e)  $f(x) = \log_7(xe^x)$

(f)  $h(t) = t^{\sin t}$

(g)  $g(s) = (\cos s)^{\ln s}$

(h)  $f(t) = \arctan \sqrt{\frac{1-t}{1+t}}$

(i)  $f(t) = \arcsin \left( \frac{2 + 3 \cos x}{3 - 2 \cos x} \right)$ .

2. Evaluate the integral:

(a)  $\int \frac{(1 + \sqrt{x})^4}{\sqrt{x}} dx$

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

(c)  $\int_0^1 xe^{-x^2} dx$

(d)  $\int (x^6 + 6^x) dx$

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

(f)  $\int \frac{3^x}{1 + 3^x} dx$

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

(h)  $\int \frac{x}{1 + x^4} dx$

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

3. Simplify each expression:

(a)  $\ln \sqrt{e}$

(b)  $e^{3 \ln 2}$

(c)  $e^{x + \ln x}$

(d)  $\tan(\arcsin x)$ .

4. A sound so faint that it can just be heard has an intensity  $I_0 = 10^{-12}$  watt/m<sup>2</sup>. The loudness, in decibels (dB), of a sound with intensity  $I$  is then defined to be  $L = 10 \log_{10}(I/I_0)$ . Amplified rock music is measured at 120dB, while the noise of a lawn mower at 106dB. Find the ratio of the intensity of the rock music to that of the mower.

5. The *secant*, *cosecant*, and *cotangent* functions are defined as

$$\sec x = \frac{1}{\cos x}, \quad \csc x = \frac{1}{\sin x}, \quad \cot x = \frac{1}{\tan x}.$$

Determine the domain and ranges of these three functions so that they admit inverses. Find the derivatives of these three inverses.