0. Review of Calculus

We begin this course with a refresher on differentiation and integration from MATH 1000 and MATH 1001.

0.1 Reminder of some Derivatives (review from MATH 1000)

Product Rule:

$$\frac{d}{dx}(u \cdot v) =$$

Quotient Rule:

$$\frac{d}{dx}\left(\frac{u}{v}\right) =$$

Chain Rule:

If $y = f(u)$ and $u = g(x)$ then $\frac{dy}{dx} =$

$$\frac{d}{dx}(x^n) =$$

$$\frac{d}{dx}(e^x) =$$

$$\frac{d}{dx}(\ln x) =$$

$$\frac{d}{dx}(\sin x) =$$

$$\frac{d}{dx}(\cos x) =$$

$$\frac{d}{dx}(\tan x) =$$

$$\frac{d}{dx}(\csc x) =$$

$$\frac{d}{dx}\left(\sec x\right) =$$

$$\frac{d}{dx}\left(\cot x\right) =$$

$$\frac{d}{dx}\left(e^{u(x)}\right) =$$

$$\frac{d}{dx}\left(a^{u(x)}\right) =$$

$$\frac{d}{dx}\left(u\left(x\right)\right)^{n} =$$

$$\frac{d}{dx}\sin^{n}\left(u\left(x\right)\right) =$$

Example 0.1.1

$$\frac{d}{dx}\sin^{4}\left(2x\right) =$$

$$\frac{d}{dx}\cos^{n}\left(u\left(x\right)\right) =$$

$$\frac{d}{dx}\left(\ln\left(u\left(x\right)\right)\right) =$$

Algebra of exponents: $e^u \cdot e^v =$ $\left(e^u\right)^v =$

Algebra of logarithms: $\ln(u \cdot v) =$ $\ln\left(x^n\right) =$

$$\ln\left(\frac{u}{v}\right) =$$

$$\cos^2\theta + \sin^2\theta =$$

Double angle formulae:

$$\sin(2\theta) =$$

$$\cos(2\theta) =$$

Implicit Differentiation

Example 0.1.2

Show that $\frac{d}{dx}\left(a^{u(x)}\right) = u'(x)\, a^{u(x)} \ln a$

0.2 Reminder of some Integrals (review from MATH 1001)

$$\int u'(x)\cdot\big(u(x)\big)^n\,dx =$$

Example 0.2.1

$$\int \tan^4 x\cdot\sec^2 x\,dx =$$

$$\int \frac{u'(x)}{u(x)}\,dx =$$

Example 0.2.2

$$\int \tan x\,dx =$$

Example 0.2.3

$$\int \frac{1}{x\ln x}\,dx =$$

$$\int u'(x)\,e^{u(x)}dx =$$

Example 0.2.4

$$\int x^2 e^{x^3}dx =$$

$$\int u'(x)\cos\big(u(x)\big)\,dx =$$

Example 0.2.5

$$\int \cos(kx)\,dx =$$

Example 0.2.6

$$\int e^x \cos\left(e^x\right)dx =$$

$$\int \sin^2\theta\,d\theta =$$

$$\int \cos^2\theta\,d\theta =$$

ENGI 3424 assumes mastery of the concepts and techniques in MATH 1000, 1001 and 2050.
