CALC 103

FINAL EXAM FORMULA SHEET

Limits:

$$\lim_{x\to a} C = C, \qquad \lim_{x\to\infty} \frac{1}{x} = 0, \qquad \lim_{x\to\infty} x = \infty$$

Derivatives:

* $\frac{d}{dx}[C] = 0 \quad C = \text{constant}$ * $\frac{d}{dx}[kx + C\ ] = k \quad k$ and C are constants

* $\frac{d}{dx}[cx^n] = cnx^{n-1}$ (*Power of x Rule*) * $\frac{d}{dx}[cu^n] = cnu^{n-1}\frac{du}{dx} = cnu^{n-1}\cdot u'$ (*Power of a Function of x Rule*)

* $\frac{d}{dx}[u+v] = u' + v'$ (Sum Rule) * $\frac{dy}{dx} = \frac{dy}{du}\cdot\frac{du}{dx}$ (Chain Rule)

* $\frac{d}{dx}\left[uv\right] = \frac{du}{dx}v + \frac{dv}{dx}u = u'v + uv'$ (Product Rule)

* $\frac{d}{dx}\left[\frac{u}{v}\right] = \frac{\frac{du}{dx}v - \frac{dv}{dx}u}{v^2} = \frac{u'v - uv'}{v^2}$ (Quotient Rule)

* $\frac{d}{dx}\left[\sin u\right] = \cos u\cdot\frac{du}{dx}$ * $\frac{d}{dx}\left[\cos u\right] = -\sin u\cdot\frac{du}{dx}$ * $\frac{d}{dx}\left[\tan u\right] = \sec^2 u\cdot\frac{du}{dx}$

* $\frac{d}{dx}\left[\sec u\right] = \sec u\tan u\cdot\frac{du}{dx}$ * $\frac{d}{dx}\left[\csc u\right] = -\csc u\cot u\cdot\frac{du}{dx}$ * $\frac{d}{dx}\left[\cot u\right] = -\csc^2 u\cdot\frac{du}{dx}$

* $\frac{d}{dx}\left[\log_b u\right] = \frac{1}{u\ln b}\cdot\frac{du}{dx}$ * $\frac{d}{dx}\left[\ln u\right] = \frac{1}{u}\cdot\frac{du}{dx}$

* $\frac{d}{dx}\left[b^u\right] = b^u\cdot\ln b\cdot\frac{du}{dx}$ * $\frac{d}{dx}\left[e^u\right] = e^u\cdot\frac{du}{dx}$

*Properties of Logarithm:

$\log_b AB = \log_b A + \log_b B$

$\log_b \frac{A}{B} = \log_b A - \log_b B$

$\log_b A^P = P\log_b A$

* Velocity $v = \frac{ds}{dt} = s'$ where s is a displacement function.

* Acceleration $a = \frac{dv}{dt} = \frac{d^2 s}{dt^2} = s''$

Integrations:

$*\int a\, f(x)dx = a\int f(x)dx$ $*\int [f(x) \pm g(x)]dx = \int f(x)dx \pm \int g(x)dx$

$*\int du = u + C$ $*\int u^n du = \frac{u^{n+1}}{n+1} + C \ (n \neq -1)$

$*\int_a^b f(x)dx = F(b) - F(a)$ $*\int \frac{du}{u} = \ln|u| + C \quad (u \neq 0)$

$*\int e^u du = e^u + C$ $*\int b^u du = \frac{b^u}{\ln b} + C \ (b > 0, b \neq 1)$

$*\int \sin u \ du = -\cos u + C$ $*\int \cos u \ du = \sin u + C$

$*\int \tan u \ du = -\ln|\cos u| + C$ $*\int \csc u \ du = \ln|\csc u - \cot u| + C$

$*\int \sec u \ du = \ln|\sec u + \tan u| + C$ $*\int \cot u \ du = \ln|\sin u| + C$

$*\int \sec^2 u \ du = \tan u + C$ $*\int \csc^2 u \ du = -\cot u + C$

Area under a curve, $A = \int_a^b f(x)dx = F(b) - F(a)$

Displacement, $s = \int v \ dt$ where v = velocity

Velocity, $v = \int a \ dt$ where a = acceleration