MATH 241 – Multivariable Calculus – Final Equation Sheet

Vector Form of a line

$$\vec{r}(t) = \vec{v}t + \vec{r}_0$$

Equation of a Plane

$$\vec{N} \cdot < x - x_0, y - y_0, z - z_0 >= 0$$

Arclength of a Curve
For a curve $\vec{r}(t)$, the length of the curve for $a \leq t \leq b$ is

$$L = \int_a^b |\vec{r}'(t)|\, dt$$

Curvature
The curvature of a curve $\vec{r}(t)$ at the point corresponding to time t is

$$\kappa(t) = \frac{|\frac{d\vec{T}}{dt}|}{|\frac{d\vec{r}}{dt}|}$$

The Discriminant
The following is the discriminant used in the second derivatives test, used for determining local maxima and minima of functions $f(x, y)$

$$D = f_{xx}(x, y) f_{yy}(x, y) - (f_{xy}(x, y))^2$$

Coordinate Systems
Spherical Coordinates:
$x = \rho \cos\theta \sin\phi$
$y = \rho \sin\theta \sin\phi$
$z = \rho \cos\phi$
$\rho^2 = x^2 + y^2 + z^2$
Cylindrical Coordinates:
$x = r \cos\theta$
$y = r \sin\theta$
$z = z$
$x^2 + y^2 = r^2$