

MA 22400 – EXAM 3 FORMULAS

LAGRANGE EQUATIONS

For the function $f(x, y)$ subject to the constraint $g(x, y) = k$, the Lagrange equations are

$$f_x = \lambda g_x \quad f_y = \lambda g_y \quad g(x, y) = k$$

LEAST-SQUARES LINE

The equation of the least-squares line for the n points $(x_1, y_1), (x_2, y_2), \dots, (x_n, y_n)$, is $y = mx + b$, where

$$m = \frac{n \sum xy - \sum x \sum y}{n \sum x^2 - (\sum x)^2} \quad b = \frac{\sum x^2 \sum y - \sum x \sum xy}{n \sum x^2 - (\sum x)^2}$$

GEOMETRIC SERIES

If $0 < |r| < 1$, then

$$\sum_{n=0}^{\infty} ar^n = \frac{a}{1-r}$$

TAYLOR SERIES

The Taylor series of $f(x)$ about $x = a$ is the power series

$$\sum_{n=0}^{\infty} a_n (x-a)^n \quad \text{where} \quad a_n = \frac{f^{(n)}(a)}{n!}$$

Examples:

$$e^x = \sum_{n=0}^{\infty} \frac{x^n}{n!}, \quad \text{for } -\infty < x < \infty; \quad \ln x = \sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{n} (x-1)^n, \quad \text{for } 0 < x \leq 2$$

VOLUME & SURFACE AREA

Right Circular Cylinder

$$V = \pi r^2 h$$

$$SA = \begin{cases} 2\pi r^2 + 2\pi r h \\ \pi r^2 + 2\pi r h \end{cases}$$

Sphere

$$V = \frac{4}{3}\pi r^3$$

$$SA = 4\pi r^2$$

Right Circular Cone

$$V = \frac{1}{3}\pi r^2 h$$

$$SA = \pi r \sqrt{r^2 + h^2} + \pi r^2$$