

USEFUL FORMULAS

Trig Formulas:

$$\sin^2 x = \frac{1 - \cos(2x)}{2}, \quad \cos^2 x = \frac{1 + \cos(2x)}{2}, \quad \sec^2 x = 1 + \tan^2 x$$

Useful Integrals:

$$\int \sec x \, dx = \ln |\sec x + \tan x| + C \quad \text{and} \quad \int \sqrt{1+x^2} \, dx = \frac{x}{2} \sqrt{1+x^2} + \frac{1}{2} \ln(x + \sqrt{1+x^2}) + C$$

Center of Mass:

$$\bar{x} = \frac{1}{A} \int_a^b x(f(x) - g(x)) \, dx \quad \text{and} \quad \bar{y} = \frac{1}{A} \int_a^b \frac{1}{2} [(f(x))^2 - (g(x))^2] \, dx$$

Arc Length, Surface Area and Volume:

$$\text{Arc Length: } L = \int_a^b \sqrt{1 + (f'(x))^2} \, dx$$

$$\text{Surface area: } S = 2\pi \int_a^b f(x) \sqrt{1 + (f'(x))^2} \, dx \text{ or } S = 2\pi \int_a^b x \sqrt{1 + (f'(x))^2} \, dx$$

Volume by the washer method: $V = \pi \int_a^b (R^2(x) - r^2(x)) \, dx$; $R(x)$ and $r(x)$ are the longer and shorter radii of the washer

$$\text{Volume by cylindrical shells: } V = 2\pi \int_a^b x f(x) \, dx$$

Maclaurin Series:

$$\text{The geometric series: } \frac{1}{1-x} = \sum_{n=0}^{\infty} x^n, \quad \text{provided } |x| < 1$$

$$\text{The exponential function: } e^x = \sum_{n=0}^{\infty} \frac{x^n}{n!} \text{ for all } x$$

$$\text{Sine: } \sin x = \sum_{n=0}^{\infty} (-1)^n \frac{x^{2n+1}}{(2n+1)!} \text{ for all } x$$

$$\text{Cosine: } \cos x = \sum_{n=0}^{\infty} (-1)^n \frac{x^{2n}}{(2n)!} \text{ for all } x$$