

USEFUL FORMULAS

Trig Formulas:

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

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:

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

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

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:

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

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

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

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

The binomial series: Provided $|x| < 1$,

$$(1+x)^k = 1 + kx + \frac{k(k-1)}{2!}x^2 + \frac{k(k-1)(k-2)}{3!}x^3 + \dots + \frac{k(k-1)(k-2)\dots(k-n+1)}{n!}x^n \dots$$