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:

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

Arc Length, Surface Area and Volume:

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

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

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

Volume by cylindrical shells: $V = 2\pi\displaystyle\int_a^b xf(x)\,dx$

Maclaurin Series:

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

Logarithm: $\ln(1+x) = \displaystyle\sum_{n=1}^{\infty}(-1)^{n-1}\frac{x^n}{n}$, provided $|x|<1$

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

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

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