Math 1206 Formula Sheet

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Integration Formulas:

1. Trig Identities: $\sin^2(x)+\cos^2(x)=1,\ 1+\tan^2(x)=\sec^2(x),\ \sin(2x)=2\sin(x)\cos(x)$

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

2. The Derivatives of Inverse Trig Functions

$$\frac{d}{dx}\sin^{-1}(x)=\frac{1}{\sqrt{1-x^2}},\ \frac{d}{dx}\tan^{-1}(x)=\frac{1}{1+x^2},\ \frac{d}{dx}\sec^{-1}(x)=\frac{1}{|x|\sqrt{x^2-1}}$$

3. Integration by parts:

$$\int u\ dv=uv-\int v\ du,\quad \int_a^b u\ dv=uv\Big|_a^b-\int_a^b v\ du$$

4. Some elementary integrals

$$\int x^r\ dx=\frac{1}{1+r}x^{1+r}+C;\ r\neq -1,\quad \int \sin(ax)\ dx=-\frac{1}{a}\cos(ax)+C,\quad \int \cos(ax)\ dx=\frac{1}{a}\sin(ax)+C$$

$$\int e^{ax}\ dx=\frac{1}{a}e^{ax}+C,\quad \int \frac{1}{x}\ dx=\ln|x|+C$$

5. Integrals involving $\sec(x)$:

$$\int \sec(x)\ dx=\ln|\sec(x)+\tan(x)|+C,\quad \int \sec^3(x)\ dx=\frac{1}{2}\sec(x)\tan(x)+\frac{1}{2}\ln|\sec(x)+\tan(x)|+C$$

Volume, Surface Area, and Arclength:

$$\pi\int_a^b (R^2-r^2)\ dx,\quad 2\pi\int_a^b f(x)\sqrt{1+[f'(x)]^2}\ dx,\quad \int_a^b \sqrt{1+[f'(x)]^2}\ dx$$

Taylor Series: Given f, its Taylor series centered at a is

$$T(x)=\sum_{n=0}^{\infty}\frac{f^{(n)}(a)}{n!}(x-a)^n=f(a)+f'(a)(x-a)+\frac{f''(a)}{2!}(x-a)^2+...+\frac{f^{(n)}(a)}{n!}(x-a)^n+...$$

The radius of convergence R: $\frac{1}{R}=\lim_{n\to\infty}\left|\frac{c_{n+1}}{c_n}\right|;\ \ c_n=\frac{f^{(n)}(a)}{n!}$