NOTATIONS

(a, b)	$\{x : a < x < b\}$
$[a, b)$	$\{x : a \le x < b\}$
$(a, b]$	$\{x : a < x \le b\}$
$[a, b]$	$\{x : a \le x \le b\}$
$\gcd(m, n)$	greatest common divisor of two integers m and n
$\operatorname{lcm}(m, n)$	least common multiple of two integers m and n
$[x]$	greatest integer m such that $m \le x$
$m \equiv k \pmod{n}$	m and k are congruent modulo n (m and k have the same remainder when divided by n, or equivalently, $m - k$ is a multiple of n)
f^{-1}	inverse of an invertible function f (not the same as $\frac{1}{f}$)
$\lim_{x \to a^+} f(x)$	right-hand limit of $f(x)$; limit of $f(x)$ as x approaches a from the right
$\lim_{x \to a^-} f(x)$	left-hand limit of $f(x)$; limit of $f(x)$ as x approaches a from the left
$\varnothing$	the empty set
$x \in S$	x is an element of set S
$S \subset T$	set S is a proper subset of set T
$S \subseteq T$	either set S is a proper subset of set T or $S = T$
$S \cup T$	union of sets S and T
$S \cap T$	intersection of sets S and T

DEFINITIONS

A relation $\Re$ on a set S is

reflexive if $x \Re x$ for all $x \in S$
symmetric if $x \Re y \Rightarrow y \Re x$ for all $x, y \in S$
transitive if $(x \Re y \text{ and } y \Re z) \Rightarrow x \Re z$ for all $x, y, z \in S$
antisymmetric if $(x \Re y \text{ and } y \Re x) \Rightarrow x = y$ for all $x, y \in S$

An equivalence relation is a reflexive, symmetric, and transitive relation.

FORMULAS

Sum

$$\sin(x \pm y) = \sin x \cos y \pm \cos x \sin y$$
$$\cos(x \pm y) = \cos x \cos y \mp \sin x \sin y$$
$$\tan(x \pm y) = \frac{\tan x \pm \tan y}{1 \mp \tan x \tan y}$$

Half-angle $\left(\text{sign depends on the quadrant of } \frac{\theta}{2}\right)$

$$\sin\frac{\theta}{2} = \pm\sqrt{\frac{1-\cos\theta}{2}}$$

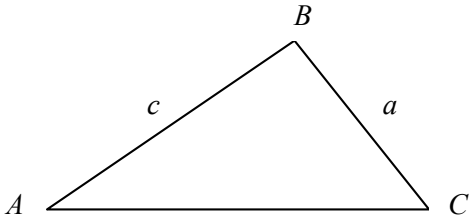
$$\cos\frac{\theta}{2} = \pm\sqrt{\frac{1+\cos\theta}{2}}$$

Range of Inverse Trigonometric Functions

$\sin^{-1} x$	$\left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$
$\cos^{-1} x$	$[0, \pi]$
$\tan^{-1} x$	$\left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$

Law of Sines

$$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$$



Law of Cosines

$$c^2 = a^2 + b^2 - 2ab(\cos C)$$

DeMoivre's Theorem

$$(\cos\theta + i\sin\theta)^k = \cos(k\theta) + i\sin(k\theta)$$

Coordinate Transformation

Rectangular (x, y) to polar (r, θ): $r^2 = x^2 + y^2$; $\tan\theta = \frac{y}{x}$ if $x \neq 0$

Polar (r, θ) to rectangular (x, y): $x = r\cos\theta$; $y = r\sin\theta$

Distance from point (x_1, y_1) to line $Ax + By + C = 0$

$$d = \frac{|Ax_1 + By_1 + C|}{\sqrt{A^2 + B^2}}$$

Volume

Sphere with radius r: $V = \frac{4}{3}\pi r^3$

Right circular cone with height h and base of radius r: $V = \frac{1}{3}\pi r^2 h$

Right circular cylinder with height h and base of radius r: $V = \pi r^2 h$

Pyramid with height h and base of area B: $V = \frac{1}{3}Bh$

Right prism with height h and base of area B: $V = Bh$

Surface Area

Sphere with radius r: $A = 4\pi r^2$

Right circular cone with radius r and slant height s: $A = \pi rs + \pi r^2$

Differentiation

$$(f(x)g(x))' = f'(x)g(x) + f(x)g'(x)$$

$$(f(g(x)))' = f'(g(x))g'(x)$$

$$\left(\frac{f(x)}{g(x)}\right)' = \frac{f'(x)g(x) - f(x)g'(x)}{(g(x))^2} \text{ if } g(x) \neq 0$$

Integration by Parts

$$\int u\,dv = uv - \int v\,du$$