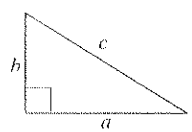
GEOMETRY

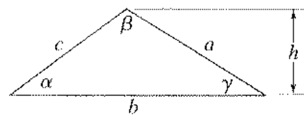
Triangles



Right triangle

Pythagorean Theorem

$a^2 + b^2 = c^2$

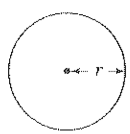


Any triangle

Angles $\alpha + \beta + \gamma = 180°$

Area $A = \frac{1}{2}bh$

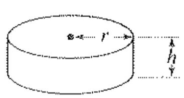
Circles



Circumference $C = 2\pi r$

Area $A = \pi r^2$

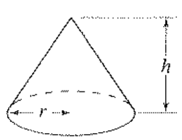
Cylinders



Surface area $S = 2\pi r^2 + 2\pi rh$

Volume $V = \pi r^2 h$

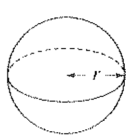
Cones



Surface area $S = \pi r^2 + \pi r\sqrt{r^2 + h^2}$

Volume $V = \frac{1}{3}\pi r^2 h$

Spheres



Surface area $S = 4\pi r^2$

Volume $V = \frac{4}{3}\pi r^3$

CONVERSIONS

1 inch = 2.54 centimeters	1 kilometer ≈ 0.62 miles
1 liter = 1000 cubic centimeters	1 liter ≈ 1.057 quarts
1 kilogram ≈ 2.20 pounds	1 pound ≈ 453.6 grams
π radians = 180 degrees	1 cubic foot ≈ 7.48 gallons

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INTEGRALS

1. $\int u\,dv = uv - \int v\,du$
2. $\int u^n\,du = \frac{1}{n+1}u^{n+1} + C, n \neq -1$
3. $\int \frac{1}{u}\,du = \ln|u| + C$
4. $\int e^u\,du = e^u + C$
5. $\int a^u\,du = \frac{a^u}{\ln a} + C$
6. $\int \sin u\,du = -\cos u + C$
7. $\int \cos u\,du = \sin u + C$
8. $\int \sec^2 u\,du = \tan u + C$
9. $\int \csc^2 u\,du = -\cot u + C$
10. $\int \sec u \tan u\,du = \sec u + C$
11. $\int \csc u \cot u\,du = -\csc u + C$
12. $\int \tan u\,du = -\ln|\cos u| + C$
13. $\int \cot u\,du = \ln|\sin u| + C$
14. $\int \sec u\,du = \ln|\sec u + \tan u| + C$
15. $\int \csc u\,du = \ln|\csc u - \cot u| + C$
16. $\int \frac{1}{\sqrt{a^2 - u^2}}\,du = \sin^{-1}\frac{u}{a} + C$
17. $\int \frac{1}{a^2 + u^2}\,du = \frac{1}{a}\tan^{-1}\frac{u}{a} + C$
18. $\int \frac{1}{a^2 - u^2}\,du = \frac{1}{2a}\ln\left|\frac{u + a}{u - a}\right| + C$
19. $\int \frac{1}{u\sqrt{u^2 - a^2}}\,du = \frac{1}{a}\sec^{-1}\left|\frac{u}{a}\right| + C$

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Formula Card
to accompany

CALCULUS, 9/E

Varberg, Purcell, and Rigdon

DERIVATIVES

$D_x x^r = rx^{r-1}$	$D_x\lvert x\rvert = \frac{\lvert x\rvert}{x}$
$D_x \sin x = \cos x$	$D_x \cos x = -\sin x$
$D_x \tan x = \sec^2 x$	$D_x \cot x = -\csc^2 x$
$D_x \sec x = \sec x \tan x$	$D_x \csc x = -\csc x \cot x$
$D_x \sinh x = \cosh x$	$D_x \coth x = -\text{csch}^2 x$
$D_x \cosh x = \sinh x$	$D_x \text{sech}\, x = -\text{sech}\, x \tanh x$
$D_x \tanh x = \text{sech}^2 x$	$D_x \text{csch}\, x = -\text{csch}\, x \coth x$
$D_x \ln x = \frac{1}{x}$	$D_x \log_a x = \frac{1}{x \ln a}$
$D_x e^x = e^x$	$D_x a^x = a^x \ln a$
$D_x \sin^{-1} x = \frac{1}{\sqrt{1 - x^2}}$	$D_x \cos^{-1} x = \frac{-1}{\sqrt{1 - x^2}}$
$D_x \tan^{-1} x = \frac{1}{1 + x^2}$	$D_x \sec^{-1} x = \frac{1}{\lvert x\rvert\sqrt{x^2 - 1}}$

Basic Identities

$\tan t = \dfrac{\sin t}{\cos t}$ $\qquad \cot t = \dfrac{\cos t}{\sin t}$ $\qquad \cot t = \dfrac{1}{\tan t}$

$\sec t = \dfrac{1}{\cos t}$ $\qquad \csc t = \dfrac{1}{\sin t}$ $\qquad \sin^2 t + \cos^2 t = 1$

$1 + \tan^2 t = \sec^2 t$ $\qquad 1 + \cot^2 t = \csc^2 t$

Cofunction Identities

$\sin\left(\dfrac{\pi}{2} - t\right) = \cos t$ $\qquad \cos\left(\dfrac{\pi}{2} - t\right) = \sin t$ $\qquad \tan\left(\dfrac{\pi}{2} - t\right) = \cot t$

Odd-even Identities

$\sin(-t) = -\sin t$ $\qquad \cos(-t) = \cos t$ $\qquad \tan(-t) = -\tan t$

Addition Formulas

$\sin(s + t) = \sin s \cos t + \cos s \sin t$ $\qquad \sin(s - t) = \sin s \cos t - \cos s \sin t$

$\cos(s + t) = \cos s \cos t - \sin s \sin t$ $\qquad \cos(s - t) = \cos s \cos t + \sin s \sin t$

$\tan(s + t) = \dfrac{\tan s + \tan t}{1 - \tan s \tan t}$ $\qquad \tan(s - t) = \dfrac{\tan s - \tan t}{1 + \tan s \tan t}$

Double Angle Formulas

$\sin 2t = 2 \sin t \cos t$ $\qquad \tan 2t = \dfrac{2 \tan t}{1 - \tan^2 t}$

$\cos 2t = \cos^2 t - \sin^2 t = 1 - 2\sin^2 t = 2\cos^2 t - 1$

Half Angle Formulas

$\sin \dfrac{t}{2} = \pm\sqrt{\dfrac{1 - \cos t}{2}}$ $\qquad \cos \dfrac{t}{2} = \pm\sqrt{\dfrac{1 + \cos t}{2}}$ $\qquad \tan \dfrac{t}{2} = \dfrac{1 - \cos t}{\sin t}$

Product Formulas

$2 \sin s \cos t = \sin(s + t) + \sin(s - t)$ $\qquad 2 \cos s \cos t = \cos(s + t) + \cos(s - t)$

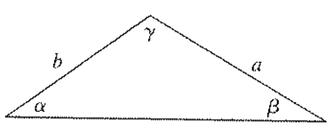
$2 \cos s \sin t = \sin(s + t) - \sin(s - t)$ $\qquad 2 \sin s \sin t = \cos(s - t) - \cos(s + t)$

Factoring Formulas

$\sin s + \sin t = 2 \cos \dfrac{s - t}{2} \sin \dfrac{s + t}{2}$ $\qquad \cos s + \cos t = 2 \cos \dfrac{s + t}{2} \cos \dfrac{s - t}{2}$

$\sin s - \sin t = 2 \cos \dfrac{s + t}{2} \sin \dfrac{s - t}{2}$ $\qquad \cos s - \cos t = -2 \sin \dfrac{s + t}{2} \sin \dfrac{s - t}{2}$

Laws of Sines and Cosines



$\dfrac{\sin \alpha}{a} = \dfrac{\sin \beta}{b} = \dfrac{\sin \gamma}{c}$

$a^2 = b^2 + c^2 - 2bc \cos \alpha$

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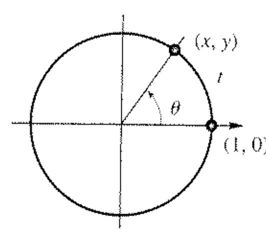
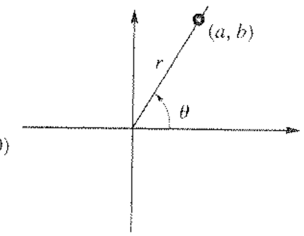
TRIGONOMETRY

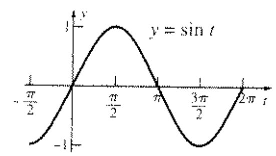


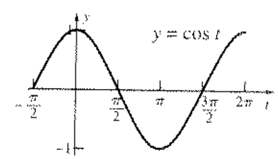


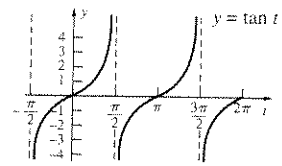
$\sin t = \sin \theta = y = \dfrac{b}{r}$ $\qquad \cos t = \cos \theta = x = \dfrac{a}{r}$

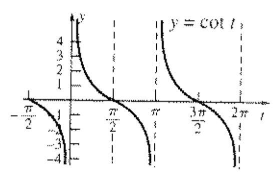
$\tan t = \tan \theta = \dfrac{y}{x} = \dfrac{b}{a}$ $\qquad \cot t = \cot \theta = \dfrac{x}{y} = \dfrac{a}{b}$

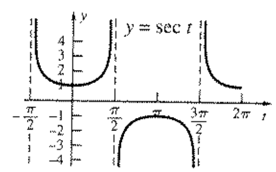
Graphs

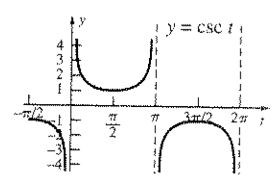












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Inverse Trigonometric Functions

$y = \sin^{-1} x \Leftrightarrow x = \sin y, -\pi/2 \le y \le \pi/2$

$y = \cos^{-1} x \Leftrightarrow x = \cos y, 0 \le y \le \pi$

$y = \tan^{-1} x \Leftrightarrow x = \tan y, -\pi/2 < y < \pi/2$

$y = \sec^{-1} x \Leftrightarrow x = \sec y, 0 \le y \le \pi, y \ne \pi/2$

$\sec^{-1} x = \cos^{-1}(1/x)$

Hyperbolic Functions

$\sinh x = \dfrac{1}{2}(e^x - e^{-x})$ $\qquad \cosh x = \dfrac{1}{2}(e^x + e^{-x})$

$\tanh x = \dfrac{\sinh x}{\cosh x}$ $\qquad \coth x = \dfrac{\cosh x}{\sinh x}$

$\operatorname{sech} x = \dfrac{1}{\cosh x}$ $\qquad \operatorname{csch} x = \dfrac{1}{\sinh x}$

Series

$\dfrac{1}{1 - x} = 1 + x + x^2 + x^3 + \cdots, -1 < x < 1$

$\ln(1 + x) = x - \dfrac{x^2}{2} + \dfrac{x^3}{3} - \dfrac{x^4}{4} + \cdots, -1 < x \le 1$

$\tan^{-1} x = x - \dfrac{x^3}{3} + \dfrac{x^5}{5} - \dfrac{x^7}{7} + \cdots, -1 \le x \le 1$

$e^x = 1 + x + \dfrac{x^2}{2!} + \dfrac{x^3}{3!} + \cdots$

$\sin x = x - \dfrac{x^3}{3!} + \dfrac{x^5}{5!} - \dfrac{x^7}{7!} + \cdots$

$\cos x = 1 - \dfrac{x^2}{2!} + \dfrac{x^4}{4!} - \dfrac{x^6}{6!} + \cdots$

$\sinh x = x + \dfrac{x^3}{3!} + \dfrac{x^5}{5!} + \dfrac{x^7}{7!} + \cdots$

$\cosh x = 1 + \dfrac{x^2}{2!} + \dfrac{x^4}{4!} + \dfrac{x^6}{6!} + \cdots$

$(1 + x)^p = 1 + \binom{p}{1}x + \binom{p}{2}x^2 + \binom{p}{3}x^3 + \cdots, -1 < x < 1$

$\binom{p}{k} = \dfrac{p(p - 1)(p - 2)\cdots(p - k + 1)}{k!}$