Maths

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Algebra

Lines

Slope of the line through $P_1 = (x_1, y_1)$ and $P_2 = (x_2, y_2)$:

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

Slope-intercept equation of line with slope m and y-intercept b:

$$y = mx + b$$

Point-slope equation of line through $P_1 = (x_1, y_1)$ with slope m:

$$y - y_1 = m(x - x_1)$$

Circles

Equation of the circle with center (a, b) and radius r:

$$(x - a)^2 + (y - b)^2 = r^2$$

Distance and Midpoint Formulas

Distance between $P_1 = (x_1, y_1)$ and $P_2 = (x_2, y_2)$:

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

Midpoint of $\bar{P_1 P_2}$:

$$(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2})$$

Laws of Exponents

$$x^m x^n = x^{m+n}$$
$$\frac{x^m}{x^n} = x^{m-n}$$
$$(x^m)^n = x^{mn}$$
$$x^{-n} = \frac{1}{x^n}$$
$$(xy)^n = x^n y^n$$
$$(\frac{x}{y})^n = \frac{x^n}{y^n}$$
$$x^{\frac{1}{n}} = \sqrt[n]{x}$$
$$\sqrt[n]{xy} = \sqrt[n]{x}\sqrt[n]{y}$$
$$\sqrt[n]{\frac{x}{y}} = \frac{\sqrt[n]{x}}{\sqrt[n]{y}}$$
$$x^{\frac{m}{n}} = \sqrt[n]{x^m} = (\sqrt[n]{x})^m$$

Special Factorizations

$$x^2 - y^2 = (x+y)(x-y)$$
$$x^3 + y^3 = (x+y)(x^2 - xy + y^2)$$
$$x^3 - y^3 = (x-y)(x^2 + xy + y^2)$$

Binomial Theorem

$$(x+y)^2 = x^2 + 2xy + y^2$$
$$(x-y)^2 = x^2 - 2xy + y^2$$
$$(x+y)^3 = x^3 + 3x^2y + 3xy^2 + y^3$$
$$(x-y)^3 = x^3 - 3x^2y + 3xy^2 - y^3$$
$$(x+y)^n = x^n + nx^{n-1}y + \frac{n(n-1)}{2}x^{n-2}y^2 + \ldots + \binom{n}{k}x^{n-k}y^k + \ldots + nxy^{n-1} + y^n$$
$$\text{where } \binom{n}{k} = \frac{n(n-1)\ldots(n-k+1)}{1\cdot 2\cdot 3\ldots k}$$

Quadratic Formula

If $ax^2 + bx + c = 0$, then $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$.

Inequalities and Absolute Value

If $a < b$ and $b < c$, then $a < c$.
If $a < b$, then $a + c < b + c$.
if $a < b$ and $c > 0$, then $ca < cb$.
if $a < b$ and $c < 0$, then $ca > cb$.
$|x| = x$ if $x >= 0$
$|x| = -x$ if $x <= 0$

Geometry

Formulas for area A, circumference C, and volume V
Triangle

$$A = \frac{1}{2}bh$$
$$A = \frac{1}{2}ab\sin(\theta)$$

Circle

$$A = \pi r^2$$
$$C = 2\pi r$$

Sector of Circle

$$A = \frac{1}{2}r^2\theta$$
$$s = r\theta$$

Sphere

$$V = \frac{4}{3}\pi r^3$$
$$A = 4\pi r^2$$

Cylinder

$$V = \pi r^2 h$$

Cone

$$V = \frac{1}{3}\pi r^2 h$$
$$A = \pi r\sqrt{r^2 + h^2}$$

Cone with arbitrary base

$$V = \frac{1}{3}Ah$$

Trigonometry

Pythagorean Theorem: For a right trianlge with hypotenuse of length c and legs of lengths a and b, $c^2 = a^2 + b^2$.

Angle Measurement

Precalculus Review