ALGEBRA

ARITHMETIC OPERATIONS
\( a(b + c) = ab + ac \)
\( \frac{a}{b} + \frac{c}{d} = \frac{ad + bc}{bd} \)
\( \frac{a + c}{b} = \frac{a}{b} + \frac{c}{b} \)
\( \frac{a}{b} - \frac{c}{d} = \frac{ad - bc}{bd} \)

EXONENTS AND RADICALS
\( x^n \cdot x^m = x^{n+m} \)
\( \frac{x^n}{x^m} = x^{n-m} \)
\( (x^n)^m = x^{nm} \)
\( x^{1/n} = \sqrt[n]{x} \)
\( \sqrt[n]{xy} = \sqrt[n]{x} \cdot \sqrt[n]{y} \)

FACTORING SPECIAL POLYNOMIALS
\( x^2 - y^2 = (x + y)(x - y) \)
\( x^3 - y^3 = (x + y)(x^2 - xy + y^2) \)
\( x^3 + y^3 = (x + y)(x^2 - xy + y^2) \)

BINOMIAL THEOREM
\( (x + y)^2 = x^2 + 2xy + y^2 \)
\( (x - y)^2 = x^2 - 2xy + y^2 \)
\( (x + y)^3 = x^3 + 3x^2y + 3xy^2 + y^3 \)
\( (x - y)^3 = x^3 - 3x^2y + 3xy^2 - y^3 \)
\( (x + y)^n = x^n + nx^{n-1}y + \binom{n}{2} x^{n-2}y^2 + \cdots + \binom{n}{k} x^{n-k}y^k + \cdots + nx^2y^{n-1} + y^n \)
where \( \binom{n}{k} = \frac{n(n-1)\cdots(n-k+1)}{1 \cdot 2 \cdot 3 \cdots k} \)

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 \( ac < cb \).
If \( a < b \) and \( c < 0 \), then \( ac > cb \).
If \( a > 0 \), then
\( |x| = a \) means \( x = a \) or \( x = -a \)
\( |x| < a \) means \( -a < x < a \)
\( |x| > a \) means \( x > a \) or \( x < -a \)

GEOMETRY

GEOMETRIC FORMULAS
Formulas for area \( A \), circumference \( C \), and volume \( V \):
- Triangle
  \( A = \frac{1}{2}bh \)
- Circle
  \( A = \pi r^2 \)
  \( C = 2\pi r \)
  \( s = r\theta \) (\( \theta \) in radians)
- Sphere
  \( V = \frac{4}{3}\pi r^3 \)
- Cylinder
  \( V = \pi r^2h \)
- Cone
  \( V = \frac{1}{3}\pi r^2h \)

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 \( \overline{P_1P_2} \):
\( \left( \frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right) \)

LINES
Slope of line through \( P_1(x_1, y_1) \) and \( P_2(x_2, y_2) \):
\( m = \frac{y_2 - y_1}{x_2 - x_1} \)
Point-slope equation of line through \( P_1(x_1, y_1) \) with slope \( m \):
\( y - y_1 = m(x - x_1) \)
Slope-intercept equation of line with slope \( m \) and \( y \)-intercept \( b \):
\( y = mx + b \)

CIRCLES
Equation of the circle with center \((h, k)\) and radius \( r \):
\( (x - h)^2 + (y - k)^2 = r^2 \)