### Formula Sheet for College Algebra Final Exam

#### Properties of Exponents
1. \( a^n a^m = a^{n+m} \)
2. \( \frac{a^n}{a^m} = a^{n-m} \)
3. \( (a^n)^m = a^{nm} \)
4. \( (a^n b^m)^p = a^{np} b^{mp} \)
5. \( \left( \frac{a^n}{b^m} \right)^p = \frac{a^{np}}{b^{mp}} \)
6. \( b^{-p} = \frac{1}{b^p} \)

#### Quadratic Formula
\[ x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \]

#### Circle
\[ (x-h)^2 + (y-k)^2 = r^2 \]
- **center** = \((h,k)\)
- **radius** = \(r\)

#### Vertex of Parabola
\[ f(x) = a(x-h)^2 + k \]
- **Vertex at** \((h,k)\)

#### Absolute Value Inequalities
- \(|E| \leq k\) if and only if \(-k \leq E \leq k\)
- \(|E| \geq k\) if and only if \(E \leq -k\) or \(E \geq k\)

#### Midpoint Formula
\[ M = \left( \frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right) \]

#### Distance Formula
\[ d = \sqrt{(x_2-x_1)^2 + (y_2-y_1)^2} \]

#### Equations for Graphing Lines
- \( m = \frac{y_2 - y_1}{x_2 - x_1} \)
- \( y - y_1 = m(x - x_1) \)

#### Interest Formulas
- **compound**
  \[ A = P \left( 1 + \frac{r}{n} \right)^n \]
- **continuous**
  \[ A = Pe^{rt} \]

#### Remainder Theorem:
For any Poly. \( P(x) \), the remainder obtained when dividing \( P(x) \) by \( x - r \) is \( P(r) \).

#### Rational Root Theorem:
Let \( P(x) = a_n x^n + a_{n-1} x^{n-1} + \ldots + a_1 x + a_0 \), where all coefficients are integers and \( n \) is a positive integer. If \( \frac{c}{d} \) is a root of \( P(x) \) then \( c \) is a factor of \( a_0 \) and \( d \) is a factor of \( a_n \).

#### Change of Base Formula
\[ \log_b x = \frac{\log_{10} x}{\log_{10} b} \]

### Change of Base Formula
\[ \log_{10} \frac{x}{b} = \log_{10} x - \log_{10} b \]