

## Math 102 things to know:

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

Midpoint Formula:  $\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$

Interval notation: ( ) for <, >, and  $\pm \infty$ ; [ ] for  $\leq$  or  $\geq$

Function Notation: f(a) means put a everywhere you see x in f.

Graph functions: linear, quadratic, polynomial, absolute value, rational, exponential, logarithmic, and piecewise.

Slope of a line:  $m = \frac{y_2 - y_1}{x_2 - x_1}$

Slope-Intercept Form of a Line:  $y = mx + b$

Point-Slope Form of a Line:  $y - y_1 = m(x - x_1)$

Parallel Line: same slope.

Perpendicular Line: negative reciprocal slope.  $m_{\perp} = \frac{-1}{m}$

Continuity. Increasing / decreasing / constant.

Powers of i:  $i, i^2 = -1, i^3 = -i, i^4 = 1$

Simplify radicals and negative radicals.

Conjugate of  $a + bi$  is  $a - bi$

Rationalize a denominator: multiply top and bottom by the conjugate of the denominator

Test for Symmetry:

x-axis: replace y with -y

y-axis: replace x with -x

origin: replace x with -x and y with -y

Absolute Value Equations: if  $|x| = k$ , rewrite as  $x = k$  or  $x = -k$

Absolute Value Inequalities:

1. If  $|x| > k$ , rewrite as  $x > k$  or  $x < -k$ , interval notation:  $(-\infty, -k)$  or  $(k, \infty)$

2. If  $|x| < k$ , rewrite as  $-k < x < k$ , interval notation:  $(-k, k)$

Vertex Formula: the vertex of  $ax^2 + bx + c = 0$  is  $\left(\frac{-b}{2a}, f\left(\frac{-b}{2a}\right)\right)$

Square Root Property: If  $x^2 = k$  then  $x = \pm\sqrt{k}$

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

Use difference quotient.

Composition:  $(f \circ g)(x) = f(g(x))$

Polynomial division and synthetic division.

Finding the roots of a polynomial function.

Direct Variation:  $y = kx^n$

Inverse Variation:  $y = \frac{k}{x^n}$

Joint Variation:  $y = kx^n z^m$

Vertical Asymptotes: Set the denominator equal to zero and solve

Horizontal / Oblique Asymptotes: look at degree of the numerator and the degree of the denominator.

1. If num degree = den degree: HA is fraction of the leading coefficients

2. If den degree > num degree: HA is  $y = 0$

3. If num degree is 2 or more degrees higher than den degree: no HA

4. If num degree is exactly 1 higher than den degree: find the OA by doing synthetic division

Inverse Function: everything must be one-to-one. Interchange the variables and solve for y.

Solve exponential equation: rewrite with same base OR take a log on each side.

Definition of a log:  $\log_a x = y$  means  $a^y = x$

Common Log:  $\log x = \log_{10} x$

Natural Log:  $\ln x = \log_e x$

Log Properties:

$$\log_a 1$$

$$\log_a a = 1$$

$$\log_a xy = \log_a x + \log_a y$$

$$\log_a \frac{x}{y} = \log_a x - \log_a y$$

$$\log_a x^r = r \log_a x$$

$$\log_a a^r = r$$

Change of Base Formula:  $\log_a x = \frac{\log_b x}{\log_b a}$  for b pick 10 or e

Solve logarithmic equation by dropping logs OR rewriting as an exponential equation; positive answers only.

Circle:  $(x - h)^2 + (y - k)^2 = r^2$  where (h, k) is the center and r is the radius

Parabola with Horizontal Axis:  $x - h = a(y - k)^2$

Ellipse:  $\frac{(x-h)^2}{a^2} + \frac{(y-k)^2}{b^2} = 1$

Hyperbola:  $\frac{(x-h)^2}{a^2} - \frac{(y-k)^2}{b^2} = 1$

Solve systems of linear equations with the calculator.