The Math Placement Exam will be held on Saturday, December 3. It is your responsibility to contact the Math Department (7th floor of AP&M building) to register and obtain the correct information about the exam. The exam will cover materials from our class through precalculus and trigonometry. The exam will be in multiple choices format. There will be roughly 60 questions for 90 minutes. Calculator is allowed but not required. Below are a few highlighted topics.

Remark: You may use the placement exam to replace the final for our class. If you choose not to take this placement exam, then you have to pass the final exam in order to pass Math 2 and move on to Math 3C.

   - Basic operations on integers, fractions, and exponents.
   - Order of operation.
   - Absolute value. Finding the graph of \( y = |f(x)| \) given the graph of \( f(x) \).
   - Substitute specific values into a given expression.
   - Area of a square, rectangle, triangle, circle, trapezoid.
   - Perimeter of a rectangle and triangle; circumference of a circle.
   - Surface area and volume of 3D objects such as a cube or a sphere.
   - Percentage and proportion.
   - Finding the midpoint of a line segment.

2. Linear Equations and Systems.
   - Equation of a line in both standard and slope-intercept form.
   - Writing the equation of a line in the slope-intercept form given
     - The slope and one point on the line,
     - Two points on the line,
     - One point on the line and the fact that the required line is parallel/perpendicular to another line.
   - Identifying the graph of a line given its equation, and vice versa.
   - Finding \( x \)- and \( y \)-intercepts of a line given its equation.
   - Solving systems of linear equations using substitution and addition/elimination.
   - Identifying the number of solutions in a given system of linear equations. Finding the intersection between two lines.
   - Solving linear equation involving absolute values.

3. Exponents, Polynomials, Rational Functions, and Radicals
   - Basic properties for \( a^0, a^{-m}, a^{m+n}, a^{m-n}, a^{mn}, (ab)^m \) and \( \left( \frac{a}{b} \right)^m \) where \( a, b \) are two real numbers and \( m, n \) are two positive integers.
• Simplifying an expression that involves exponents.
• Identifying polynomial and finding the degree and leading coefficient of a polynomial.
• Basic operations on polynomials.
• Factoring polynomials and simplifying rational functions.

4. Square Roots and Radicals
• Definition of a square root. Finding positive (principal) and negative square root of a given nonnegative number.
• Definition of an \( n \)-th root. Results for \( \sqrt[n]{a} \) and \( (\sqrt[n]{a})^n \) (remember the absolute value).
• Definition of rational exponent \( a^{m/n} \) for a real number \( a \) and positive integers \( m, n \) that share no common factors and \( n > 1 \). Converting between rational exponent and radical notation: \( a^{m/n} = \sqrt[n]{a^m} = (\sqrt[n]{a})^m \).
• Multiplication and division property of radicals. Simplified form of a radical. Know how to simply a radical expression.
• Definition of like radicals. Addition and subtraction of radicals. \textit{Note:} sometimes it is necessary to simplify the radicals before adding or subtracting.
• Solving equations that involve radicals.

5. Quadratic, Parabola, and Completing the Square
• Identities for perfect squares \( (a + b)^2, (a - b)^2 \) and difference between two squares \( a^2 - b^2 \).
• Completing the square.
• Solving quadratic equation \( ax^2 + bx + c = 0, (a \neq 0) \). Solving equations that is quadratic in form.
• Using the discriminant \( b^2 - 4ac \) to find the number of real-valued solutions in the quadratic equation \( ax^2 + bx + c = 0 \). This is also the number of \( x \)-intercept of \( ax^2 + bx + c \).
• Pythagorean theorem that relates the lengths of three sides of a right triangle.
• Writing a quadratic function \( ax^2 + bx + c \) into the form \( a(x - h)^2 + k \). Finding vertex, axis of symmetry, \( x \)-intercept, \( y \)-intercept, and max/min value of \( ax^2 + bx + c \). Finding horizontal and vertical shift.

6. Exponential and Logarithm Functions
• Definition of exponential and logarithm functions. Converting an equation between its logarithm form and exponential form. Common logarithm functions (base 10 and base \( e \)).
• Properties of a logarithm function: \( \log_b (1), \log_b (b), \log_b (b^p), \log_b (x^p), b^\log_b x, \log_b (xy), \log_b \left(\frac{x}{y}\right) \), for any \( b, x, y > 0 \) and \( b \neq 1 \).
• Change-of-basis formula

\[ \log_b(a) = \frac{\log(a)}{\log(b)} = \frac{\ln(a)}{\ln(b)}. \]

• Solving equations that involve exponential and logarithm.

• Using your graphing calculator to plot the graph of exponential \((y = b^x)\) and logarithm functions \((y = \log_b(x))\) for various bases \((b > 1 \text{ and } 0 < b < 1)\).

7. Extra Topics (beyond the scope of Math 2)

• Converting between degree and radian measures.

• Basic trigonometry functions \(\sin, \cos, \tan, \cot, \sec, \csc\) and their graphs.

• Similar triangles.

• Finding the arc-length on a circle.

• Solving inequalities and finding intervals of \(x\)-values in which \(f(x) \geq 0\) or \(f(x) \leq 0\).

• Function composition.

• Finding inverse function for a general function \(f(x)\).