NASSAU COMMUNITY COLLEGE

MATH ADVISEMENT GUIDE

(STEM)

Science Engineering Technology and Mathematics

This guide is for students who plan to take the following STEM math courses:
MAT 109, MAT 111, MAT 112, MAT 116, MAT 117 or MAT 122

Students who plan to take the following non-STEM math courses:
MAT 001, MAT 002, MAT 003, MAT 012, MAT 013,
MAT 100, MAT 101, MAT 102, MAT 114 or MAT 118
should refer to the
MATH ADVISEMENT GUIDE (non-STEM)

Successful Completion of: MAT 002 or MAT 003

- Students may take MAT 109 (College Algebra & Trigonometry)
- Students whose placement is ENG 001 or RDG 001 must successfully complete these courses before taking a credit math course

Successful Completion of: MAT 012 or MAT 013

- Students may take MAT 109 (College Algebra & Trigonometry) with its co-requisite MAT 009
- Students whose placement is ENG 001 or RDG 001 must successfully complete these courses before taking a credit math course

Math Placement: MAT 100

- Students may take MAT 109 (College Algebra & Trigonometry) with its co-requisite MAT 009
- Students whose placement is ENG 001 or RDG 001 must successfully complete these courses before taking a credit math course
- Students looking to take non-STEM math courses as permitted by their program should refer to the MATH ADVISEMENT GUIDE (non-STEM)

(Continued)

Math Placement: MAT 109

- Students who plan to take MAT 111 (Pre-Calculus) or MAT 122 (Calculus I) are encouraged to go to the Placement Testing Center to take the Advanced Algebra and Functions Test to determine their highest math placement
- Students may take MAT 109 (College Algebra & Trigonometry) or MAT 116 (Engineering Technical Math I)
- Students whose placement is ENG 001 or RDG 001 must successfully complete these courses before taking a credit math course
- Students looking to take non-STEM math courses as permitted by their program should refer to the MATH ADVISEMENT GUIDE (non-STEM)

Math Placement: MAT 111 OR a grade of C or higher in MAT 109 or MAT 116

- Students may take either of the following:
  - **MAT 111** – Pre-Calculus (4 credits)

    or
  - **MAT 117** – Engineering Technical Math II (4 credits)
    (Students will not receive credit for both MAT 111 **and** MAT 117)
- Students looking to take non-STEM math courses as permitted by their program should refer to the MATH ADVISEMENT GUIDE (non-STEM)

Math Placement: MAT 112 OR a grade of C or higher in MAT 111 or MAT 117

- Students may take either of the following:
  - **MAT 112** - Calculus with Applications in Business and Social Sciences (4 credits)

    or
  - **MAT 122** - Calculus I (4 credits)
    (Students will not receive credit for both MAT 112 **and** MAT 122)
- Students looking to take non-STEM math courses as permitted by their program should refer to the MATH ADVISEMENT GUIDE (non-STEM)

Continue reading for detailed descriptions of courses

Students should carefully consider the descriptions below to decide which courses are most appropriate for them. Some descriptions include information that supplements the college catalog.

CREDIT STEM MATH COURSES (MAT 109, 111, 112,116, 117, 122)

MAT 109 - College Algebra & Trigonometry (4 credits)

Math Placement: MAT 109 or higher.
Prerequisite:
A grade of S in MAT 002 or MAT 003, or
College Placement of MAT 100 with co-requisite MAT 009****, or
A grade of S in MAT 012 or MAT 013 with co-requisite MAT 009****.
Students must have satisfied ENG 001 and RDG 001 developmental course requirements prior to starting the course.
Students with college placement of MAT 100 who wish to take MAT 109 (College Algebra & Trigonometry) must register for both MAT 109 and its co-requisite MAT 009****.

Course Description: This course considers fundamental ideas from algebra, trigonometry and functions including exponentials and logarithms. A problem-solving approach is used. MAT 109 satisfies SUNY GEN ED-GMAT; NCC GEN ED-MATH.

This course is intended to prepare students for MAT 111 (Pre-Calculus) and may be of particular interest to students interested in science, technology, engineering or mathematics careers.

It further develops the algebra from MAT 002 (Introductory Algebra) or MAT 003 (Integrated Arithmetic and Introductory Algebra).

****MAT 009 - Support for College Algebra and Trigonometry (0 credits – 1.5 contact hours)**
Math Placement: MAT 100 placement or S in MAT 012 or MAT 013.
Prerequisite: Students must have satisfied ENG 001 and RDG 001 developmental requirements.
Co-requisite: MAT 109.
Course Description: This course is intended for students who otherwise would have to take MAT 002 prior to enrolling in MAT 109. These are students who have a MAT 100 placement or who have satisfactorily completed MAT 012 or MAT 013. This course is designed to support students taking MAT 109, College Algebra and Trigonometry, by reviewing material recently covered in the course and strengthening students' skills in preparation for upcoming topics.

Students who plan to take MAT 109, some of the skills they are expected to know before entering the class are listed below.

- Express $-8^0 + 3^{-1}$ as a single fraction.

  Answer: $-\frac{2}{3}$

- Find the product of $(2x-4)(3x+5)$.
  Answer: $6x^2-2x-20$

- Solve for *r*: $2\pi r = c$.
  Answer: $r = \frac{c}{2\pi}$

- Solve for *x*: $\frac{14}{6x} = \frac{3}{2}$.
  Answer: $x = \frac{14}{9}$

- Factor completely: $25x^2 - 36y^2$.
  Answer: $(5x+6y)(5x-6y)$

- If $y-3x=-2$, find the slope and the y-intercept.
  Answer: slope: 3 and *y*-intercept: $(0,-2)$

- Simplify: $\sqrt{32}$
  Answer: $4\sqrt{2}$

- Add: $\frac{1}{x}+\frac{1}{y}$
  Answer: $\frac{x+y}{xy}$

- Solve for *x*: $x^2+5x=-6$
  Answer: $x=\{-2,-3\}$

- Simplify $\frac{12x^7y^8}{4x^5y^9}$ and express the answer with positive exponents.
  Answer: $\frac{3x^2}{y}$

MAT 111 - Pre-Calculus (4 credits)

Math Placement: MAT 111 or higher.
Prerequisite: a grade of C or higher in MAT 109 or MAT 116.
Course Description: This is a preparatory course for the study of calculus. The function concept plays a unifying role in the study of polynomial, rational, exponential, logarithmic, and trigonometric functions. Modeling, using elementary functions, is stressed throughout the course. MAT 111 satisfies SUNY GEN ED-GMAT; NCC GEN ED-MATH.

This course may be of particular interest to students interested in science, technology, engineering or mathematics careers.

Students who plan to take MAT 111 will be expected to have a strong foundation in intermediate algebra, some knowledge of functions, graphing and trigonometry. Below are some concepts the instructor will expect students to be familiar with before entering the class. If this material is unfamiliar to students, then they should consider taking MAT 109 before taking MAT 111.

- Express $\frac{5}{x}-\frac{3}{x-2}$ as a single fraction.

  Answer: $\frac{2x-10}{x^2-2x}$

- Find an equation of the line passing through the points $(2,-6)$ and $(5,-12)$.

  Answer: $y=-2x-2$

- Simply the expression $\frac{\sqrt{x}\cdot x^2}{x^4}$ and express the answer with positive exponents.

  Answer: $\frac{1}{x^{\frac{3}{2}}}$

- What is the exact value of $\sin 60^\circ$?

  Answer: $\frac{\sqrt{3}}{2}$

- Solve $3x^2-5x+1=0$ for x.

  Answer: $x=\frac{5\pm\sqrt{13}}{6}$

- Solve for x: $5=ax+xy$

  Answer: $x=\frac{5}{a+y}$

- If $f(x)=x^2$ then what is $f(x+h)$?

  Answer: $f(x+h)=x^2+2xh+h^2$

- Remove the parentheses and simplify the expression $9a^2-\left[7a^2-12a-(a^2-3a)\right]$.

  Answer: $3a^2+9a$

- Factor completely: $3x^3+27x^2-156x$.

  Answer: $3x(x+13)(x-4)$

- Factor completely: $x^4-2bx^2+b^2$.

  Answer: $\left(x^2-b\right)^2$

MAT 112 - Calculus with Applications in Business and Social Sciences (4 credits)

This course is intended for students enrolled in non-STEM programs.

Math Placement: MAT 112.
Prerequisite: a grade of C or higher in MAT 111 or MAT 117.
Course Description: This course is NOT recommended for Math, Engineering, Science or Computer Science students and it does NOT satisfy the prerequisite for MAT 123 (Calculus II). This course is intended to introduce the fundamental concepts and techniques of calculus to the non-science students. Special emphasis is given to applications in Business and Social Sciences. Topics include functions and graphs, the derivative and differentiation techniques of algebraic, exponential and logarithmic functions of a single variable, the concept of margin in economics, elasticity of demand, differentials, related rates and optimization problems, growth and decay applications, integrals and integration techniques, application of integrals, including producer and consumer surplus, income streams, probability. Students will NOT receive credit for both MAT 112 and MAT 122. MAT 112 satisfies SUNY GEN ED-GMAT; NCC GEN ED-MATH.

Students who plan to take MAT 112 will be expected to have a strong foundation in pre-calculus. Below are some concepts the instructor will expect students to be familiar with before entering the class.

If this material is unfamiliar to students, then they should consider taking MAT 111 before taking MAT 112.

- Find the solution set for the inequality $x^2 - 2x - 8 < 0$.
  Answer: $-2 < x < 4$

- Simplify the expression $\sqrt{2^{4x} \cdot 5^{4x}}$.
  Answer: 100^x

- Simplify the expression $\dfrac{\left(x^2+1\right)^2}{x}$ and express the answer without a denominator.
  Answer: $x^3 + 2x + x^{-1}$

- If $h(x) = \left(2x^2+1\right)^3$ and $h(x) = f(g(x))$, find $f(x)$.
  Answer: $f(x) = x^3$

- If $h(x) = \dfrac{3-x}{x^2-4}$, find the equations of all horizontal and vertical asymptotes to the graph of $h(x)$.
  Answer: Vertical asymptotes are $x = 2$ and $x = -2$
  Horizontal asymptote is $y = 0$

- If $f(x) = x^3 + 5$, find the average rate of change of $f(x)$ with respect to *x* on the interval $1 \le x \le 3$.
  Answer: 13

- Solve $e^{3x} = 27$ for *x*.
  Answer: $x = \frac{\ln 27}{3}$ which can be simplified to $x = \ln 3$

- If $f(x) = x^2$ and $h \neq 0$ express $\frac{f(x+h) - f(x)}{h}$ in simplest form.
  Answer: $2x + h$

- If $x = \ln a$ and $y = \ln b$ express $\ln \sqrt[3]{a^2 b}$ in terms of *x* and *y*.
  Answer: $\frac{1}{3}(2x + y)$ or $\frac{2x}{3} + \frac{y}{3}$

- If $f(x) = 4x^2 + 2x$, find $f\left(\frac{1}{2}\right)$.
  Answer: 2

MAT 116 – Engineering Technical Math I (4 credits)

This course is only for students enrolled in selected engineering technology programs.

Math Placement: MAT 109 or higher.
Prerequisite: Successful completion of MAT 002 or MAT 003, ENG 001 and RDG 001 developmental course requirements prior to starting the course.
Course Description: Designed for students in engineering technology programs. Topics include operations with real numbers, exponents and scientific notation, equations and inequalities, functions and graphs, system of equations and determinants, triangle trigonometry and introduction to general trig definitions, algebraic products and factoring, solving equations by factoring and quadratic formula, fractional equations and operations with algebraic fractions. Applications are considered from various scientific, technical, and practical areas. Students will NOT receive credit for both MAT 109 and MAT 116. MAT 116 satisfies SUNY GEN ED-GMAT; NCC GEN ED-MATH.

This course is intended to prepare students for MAT 117 (Engineering Technical Math II) or MAT 111 (Pre-Calculus). It further develops the algebra from MAT 002 (Introductory Algebra) or MAT 003 (Integrated Arithmetic and Introductory Algebra).

Students should only register for MAT 116 under the following conditions:

a. They need to take MAT 116 for their major
b. They need to take MAT 117 for their major, but don't yet fulfill the prerequisite

Students who plan to take MAT 116, some of the skills they are expected to know before entering the class are listed below. If this material is unfamiliar to students, then they should consider taking MAT 002 before taking MAT 116.

- Express -8^0+3^{-1} as a single fraction.

  Answer: $-\frac{2}{3}$

- Find the product of $(2x-4)(3x+5)$.

  Answer: $6x^2-2x-20$

- Solve for *r*: $2\pi r=c$.

  Answer: $r=\frac{c}{2\pi}$

- Solve for *x*: $\frac{14}{6x}=\frac{3}{2}$.

  Answer: $x=\frac{14}{9}$

- Factor completely: $25x^2-36y^2$.

  Answer: $(5x+6y)(5x-6y)$

- If $y-3x=-2$, find the slope and the y-intercept.

  Answer: slope: 3 and *y*-intercept: $(0,-2)$

- Simplify: $\sqrt{32}$

  Answer: $4\sqrt{2}$

- Add: $\frac{1}{x}+\frac{1}{y}$

  Answer: $\frac{x+y}{xy}$

- Solve for *x*: $x^2+5x=-6$

  Answer: $x=\{-2,-3\}$

- Simplify $\frac{12x^7y^8}{4x^5y^9}$ and express the answer with positive exponents.

  Answer: $\frac{3x^2}{y}$

MAT 117 – Engineering Technical Math II (4 credits)

This course is only for students enrolled in selected engineering technology programs.

Math Placement: MAT 111 or higher.
Prerequisite: a grade of C or higher in MAT 109 or MAT 116.
Course Description: Designed for students in engineering technology programs. Topics include rational exponents and radicals, functions and their graphs, polynomials, exponential, logarithmic and trigonometric functions, conic sections, introduction derivatives and integrals. Applications are considered from various scientific, technical, and practical areas. Students will NOT receive credit for both MAT 111 and MAT 117. MAT 117 satisfies SUNY GEN ED-GMAT; NCC GEN ED-MATH.

Students who plan to take MAT 117 will be expected to have a strong foundation in intermediate algebra, some knowledge of functions, graphing and trigonometry. Below are some concepts the instructor will expect students to be familiar with before entering the class. If this material is unfamiliar to students, then they should consider taking MAT 116 before taking MAT 117.

- Express $\frac{5}{x}-\frac{3}{x-2}$ as a single fraction.

  Answer: $\frac{2x-10}{x^2-2x}$

- Find an equation of the line passing through the points $(2,-6)$ and $(5,-12)$.

  Answer: $y=-2x-2$

- Simply the expression $\frac{\sqrt{x}\cdot x^2}{x^4}$ and express the answer with positive exponents.

  Answer: $\frac{1}{x^{\frac{3}{2}}}$

- What is the exact value of $\sin 60^\circ$?

  Answer: $\frac{\sqrt{3}}{2}$

- Solve $3x^2-5x+1=0$ for *x*.

  Answer: $x=\frac{5\pm\sqrt{13}}{6}$

- Solve for x: $5=ax+xy$

  Answer: $x=\frac{5}{a+y}$

- If $f(x)=x^2$ then what is $f(x+h)$?

  Answer: $f(x+h)=x^2+2xh+h^2$

- Remove the parentheses and simplify the expression $9a^2-\left[7a^2-12a-(a^2-3a)\right]$.
  Answer: $3a^2+9a$

- Factor completely: $3x^3+27x^2-156x$.
  Answer: $3x(x+13)(x-4)$

- Factor completely: $x^4-2bx^2+b^2$.
  Answer: $\left(x^2-b\right)^2$

MAT 122 - Calculus I (4 credits)

Math Placement: MAT 112.
Prerequisite: a grade of C or higher in MAT 111 or MAT 117.
Course Description: Topics include definitions of limit, continuity and derivative, rates of change, tangent to a curve, derivatives of elementary functions, products, quotients, chain rule, higher order, implicit and inverse differentiation, mean value theorem, maxima and minima, differentials, definition of definite integral, Fundamental Theorem of Integral Calculus, applications, integration of elementary functions. Students will NOT receive credit for both MAT 112 and MAT 122. MAT 122 satisfies SUNY GEN ED-GMAT; NCC GEN ED-MATH.

This course may be of particular interest to students interested in science, technology, engineering or mathematics careers.
Students who plan to take MAT 122 will be expected to have a strong foundation in pre-calculus. Below are some concepts the instructor will expect students to be familiar with before entering the class.

If this material is unfamiliar to students, then they should consider taking MAT 111 before taking MAT 122.

- Find the solution set for the inequality $x^2-2x-8<0$.
  Answer: $-2<x<4$

- Simplify the expression $\sqrt{2^{4x}\cdot 5^{4x}}$.
  Answer: 100^x

- Simplify the expression $\dfrac{\left(x^2+1\right)^2}{x}$ and express the answer without a denominator.
  Answer: x^3+2x+x^{-1}

- If $h(x)=\left(2x^2+1\right)^3$ and $h(x)=f(g(x))$, find $f(x)$.
  Answer: $f(x)=x^3$

- Find the exact value of $\tan\frac{\pi}{4}-\sin\frac{3\pi}{2}$.

  Answer: 2

- If $h(x)=\frac{3-x}{x^2-4}$, find the equations of all horizontal and vertical asymptotes to the graph of $h(x)$.

  Answer: Vertical asymptotes are $x=2$ and $x=-2$

  Horizontal asymptote is $y=0$

- If $f(x)=x^3+5,$ find the average rate of change of $f(x)$ with respect to *x* on the interval $1\le x\le 3.$

  Answer: 13

- Solve $e^{3x}=27$ for *x*.

  Answer: $x=\frac{\ln 27}{3}$ which can be simplified to $x=\ln 3$

- If $f(x)=x^2$ and $h\neq 0$ express $\frac{f(x+h)-f(x)}{h}$ in simplest form.

  Answer: $2x+h$

- If $x=\ln a$ and $y=\ln b$ express $\ln\sqrt[3]{a^2b}$ in terms of *x* and *y*.

  Answer: $\frac{1}{3}(2x+y)$ or $\frac{2x}{3}+\frac{y}{3}$

- If $f(x)=4x^2+2x$, find $f\left(\frac{1}{2}\right)$.

  Answer: 2