

MATHEMATICS PLACEMENT SURVEY

Middlebury College

This is a self-administered survey to help students determine which course might be best for them. Once this survey is complete, students will need to either seek permission to enroll in Calculus I (MATH 0121), or enroll directly in Calculus II (MATH 0122) or Linear Algebra (MATH 200) as no permission is required, or consult further via mathplacement@middlebury.edu.

Instructions

Do as much as you can on each of the following exercises:

- **There is no time limit.** Take as much time as you need.
- **This test is open-book.** Feel free to look up formulas or facts, unless the question specifies otherwise. Don't try to teach yourself a new topic you have never seen before, but if this information is not right at the forefront of your mind, go find it. This isn't an exam.
- **Show your work.** If you have access to a printer or a tablet, you can write on this PDF directly. If you don't, you can just use a scrap piece of paper and make sure the problems are labeled clearly. If you are requesting placement into MATH 121 (Calculus 1) and/or if you want more guidance from a faculty member about which math class is right for you, you will need to submit your work.
- As you go, mark each exercise as **Green**, **Yellow**, or **Red**.
 - **Green** indicates you confidently found the answer. You should actually find the answer.
 - **Yellow** indicates you think you could answer this question after some review. You've seen this before but don't remember all the details.
 - **Red** indicates you have never seen questions of this type before and don't know how to proceed.

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Part A: Are you ready for MATH 121 (Calculus 1)?

(1) Find the solution to $\frac{x+3}{x-4} = 0$

(2) Find the solution to $2x + 3 = 0$

(3) Find the solutions to $x^2 - 7x - 8 = 0$

(4) Rewrite the following expression in a single rational expression, $\frac{\text{numerator}}{\text{denominator}}$

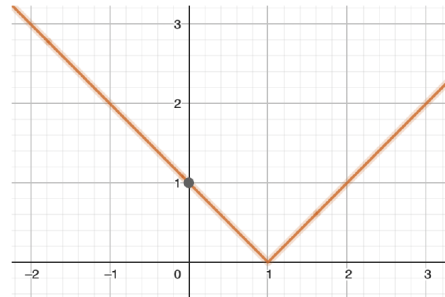
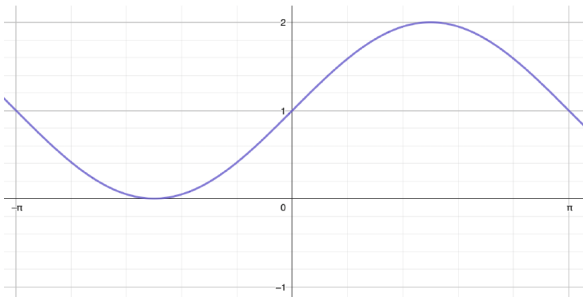
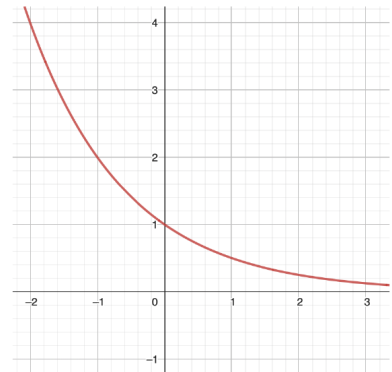
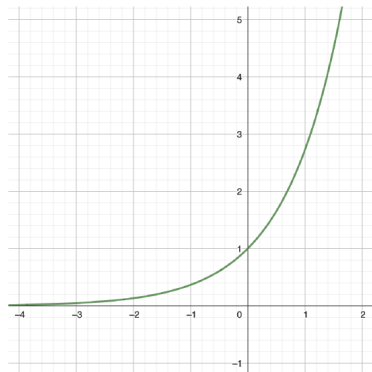
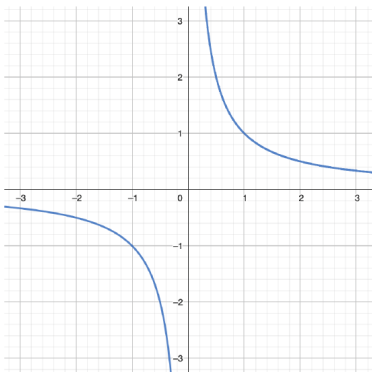
$$\frac{1}{(x+2)^2} - \frac{x}{x+2}$$

(5) Simplify $\frac{(6x)^2}{\sqrt{x}}$ as an expression of the form x^k .

(6) Find an equation for the line that passes through the point $(1, 2)$ with the slope $m = -1$.

(7) Match each of the following functions, with one of the given graphs. Do not use a graphing calculator.

$$f_1(x) = \sin(x) + 1, \quad f_2(x) = e^x, \quad f_3(x) = \frac{1}{x}, \quad f_4(x) = 2^{-x}, \quad f_5(x) = |x - 1|$$



(8) * Evaluate without a calculator e^0 and $\ln(1)$

(9) * Evaluate without a calculator $\sin(0)$ and $\cos(0)$

(10) * Find one solution to $0 = 1 + 2 \cos(x)$

When you are finished Part A...

Count how many problems you marked as **red** in Part A (1 - 10).

- If you marked more than 3 out of 10 as **red**, you should email mathplacement@middlebury.edu to discuss preparing for MATH 121 (Calculus I).
- If you marked the majority of the problems as **green** or **yellow**, you should consider yourself prepared to take MATH 121 (Calculus I).
 - Have you ever taken a course in Calculus before?
 - If you *have never* taken a course in Calculus, you should request pre-approval and submit your work for Part A here: <https://forms.gle/mVJR1d4QZCyg2nX7>
 - If you *have* previously taken a course in Calculus, but you are unsure whether or not you should place out of MATH 121 (Calculus I), proceed to Part B.
- * If you are unfamiliar with problems about trigonometry (Problems 9 and 10) or logarithms and exponents (Problem 8), you can email mathplacement@middlebury.edu to discuss options getting caught up in these topics before or during your Calculus course.

Part B: Should you place out of MATH 121 (Calculus I)?

(11) Find the derivative of $f(x) = 3x^5 - \frac{10}{x^2} + 7$

(12) Find the derivative of $f(x) = \sqrt{x^2 + 1}$

(13) Find the derivative of $f(x) = x^2(3x + 4)^5$

(14) Find $\frac{dy}{dx}$ (otherwise known as y') for $x^2 + 2xy + y^2 = 9$

(15) Evaluate: $\lim_{x \rightarrow 3} \frac{x^2 - 9}{x - 3}$

(16) Evaluate: $\lim_{x \rightarrow \infty} \frac{3x^3 - 8x + 5}{4x^4 + 2x - 7}$

(17) Evaluate: $\lim_{x \rightarrow \infty} \frac{3x^3 - 8x + 5}{4x^3 + 2x - 7}$

(18) Evaluate: $\int x^3 - 2\sqrt{x} dx$

(19) Evaluate: $\int e^{5x} dx$

(20) Determine any local maximums and minimums of $f(x) = x^4(x - 5)$

When you are finished Part B...

Count how many problems you marked as **red** in Part B (11 - 20).

- If you marked more than 3 out of 10 as **red**, you should consider taking MATH 121 (Calculus I). You should request pre-approval and submit your work for Part A and Part B here: <https://forms.gle/mVJR1d4QZCyg2nX7>
- If you marked the majority of the problems as **green** or **yellow**, you should consider yourself placed out of MATH 121 (Calculus I).
 - You can enroll in any open seats in MATH 122 (Calculus II) or MATH 200 (Linear Algebra). No pre-approval is required. You can add any open seats in either of these classes to your schedule during registration. You do not need to submit your Math Placement Survey.
 - If you are unsure which is right for you, you should talk with your advisor or email mathplacement@middlebury.edu
 - If you need MATH 121 as a pre-requisite for another course, you should contact the instructor of the course directly. ECON majors or those interested in ECON courses should contact Amy Holbrook holbrook@middlebury.edu.
 - Placing out of MATH 121 (Calculus I) is not the same as getting credit for MATH 121 (Calculus I) which counts towards graduation. More information about placement credit is under the FAQ sections at go.middlebury.edu/mathplacement.

If you have previously taken a course in Calculus, but you are unsure whether or not you should place out of MATH 122 (Calculus II), proceed to Part C.

Part C: Should you place out of MATH 122 (Calculus II)?

(21) Find the derivative of $f(x) = \sqrt{\ln(x)}$

(22) Evaluate: $\int \sqrt{x}(x^2 - 4)^2 dx$

(23) Evaluate: $\int x\sqrt{3x^2 + 5} dx$

(24) Evaluate: $\int \sin^2(x) \cos(x) dx$

(25) Evaluate: $\int \sqrt{1 - 4x^2} dx$

(26) Evaluate: $\int_0^\pi x^2 \sin(x) dx$

(27) Find the particular solution to $\frac{dy}{dx} = x^2 - 3$ where $y(0)=1$

(28) Determine whether the following series converges or diverges. If it converges, determine if it converges conditionally or absolutely. $\sum_{n=1}^{\infty} (-1)^n \frac{n}{n^2+1}$

(29) Determine whether the following series converges or diverges. If it converges, determine if it converges conditionally or absolutely. $\sum_{n=1}^{\infty} (-1)^n \frac{3^n}{\sqrt{n}}$

(30) Compute the Taylor series expansion about $x = 1$ for $f(x) = \ln(x)$

When you are finished Part C...

Count how many problems you marked as **red** in Part C (21 - 30).

- If you marked more than 3 out of 10 as **red**, you could consider taking MATH 122 (Calculus II). No pre-approval is required - you can add any open seats to your schedule during registration.
- If you marked the majority of the problems as **green** or **yellow**, you should consider yourself placed out of MATH 122 (Calculus II).
 - You can enroll in any open seats in MATH 200 (Linear Algebra). No pre-approval is required - you can add any open seats to your schedule during registration. You do not need to submit your Math Placement Survey.
 - Placing out of MATH 122 (Calculus I) is not the same as getting credit for MATH 122 (Calculus II) which counts towards graduation. More information about placement credit is under the FAQ sections at go.middlebury.edu/mathplacement.