

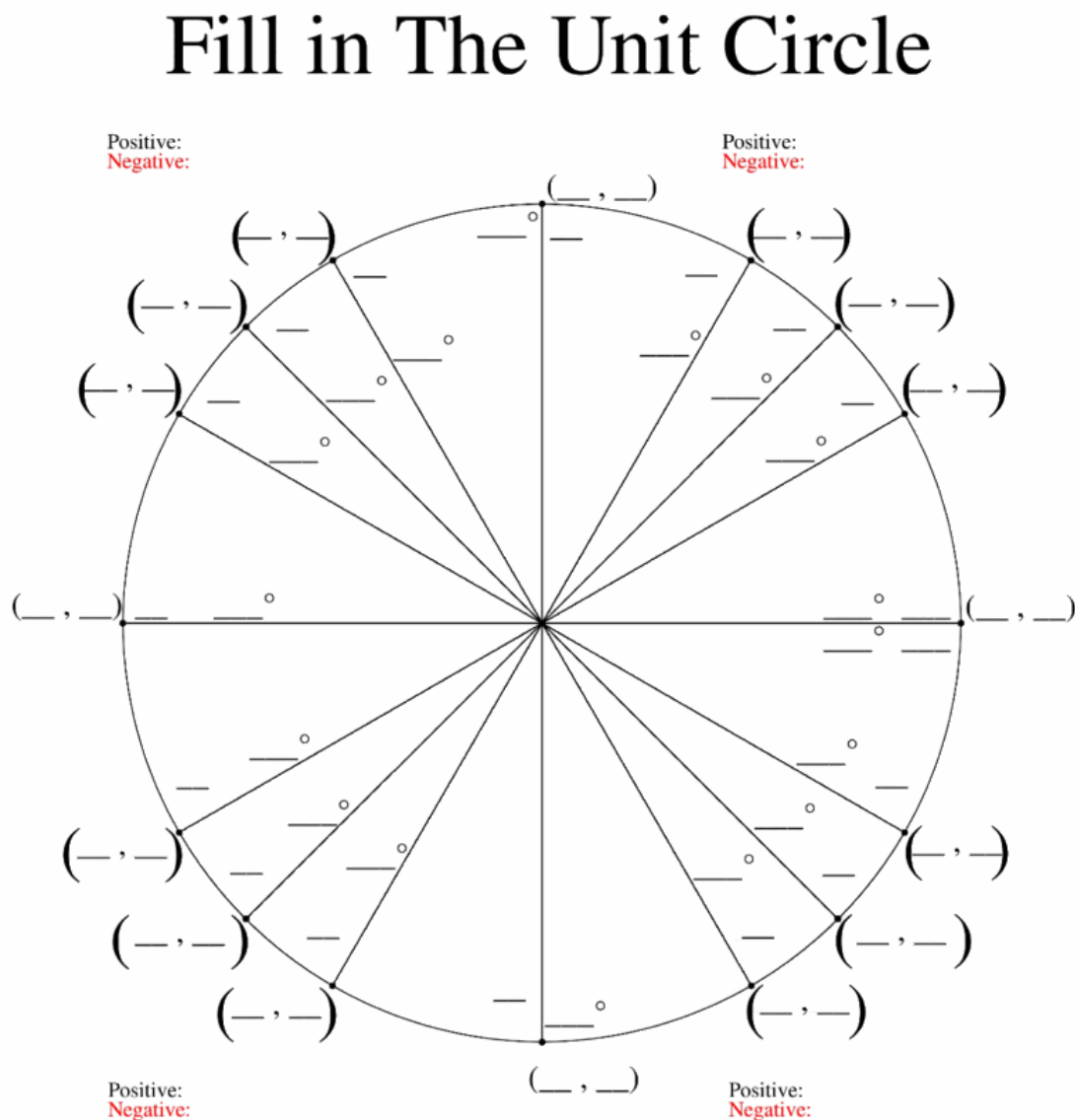
## MAT137 Calculus II: Algebra and Trigonometry Review

This review is comprised of things that I expect you to know coming into this class. There are some things that you may need to look up again and refresh your memory. Do not use a calculator or computer!

1. Simplify  $\frac{-4 - |-5|}{|-5 - (-3)|}$
2. Solve for  $x$ :  $-\frac{2}{3}(x + 4) = 6 + x$ .
3. Solve for  $x$ :  $\frac{1}{2}x - \frac{1}{3}(x - 1) = \frac{1}{6}x + 5$ .
4. Solve for  $k$ :  $ak = b(k + 1)$ .
5. Solve for  $x$ :  $x^2 - 5 = 4$ .
6. Solve for  $x$ :  $x^2 - 3x = 4$ .
7. Solve for  $x$ :  $x^2 + 4x = -4$ .
8. Solve for  $x$ :  $|x - 10| < 5$ .
9. Expand  $(e^{5x} + 3)^2$
10. Simplify  $(-2x^2y^{1/3})^6$ .
11. Simplify and express all powers in terms of positive exponents  $\sqrt[3]{\frac{-8x^5y^{-8}}{x^{-1}y^4}}$ .
12. Solve for  $x$ :  $\frac{x + 4}{3 - x} > 0$ .
13. Write the expression as a single logarithm:  $\ln 2 + 5 \ln x^2 - \frac{1}{2} \ln y$ .
14. Write the expression as a sum or difference of logarithms:  $\ln \sqrt{\frac{x^3y^4}{3z}}$ .
15. Solve for  $x$ :  $\frac{13}{x^2 - 4} = \frac{2}{x - 2} - \frac{3}{x + 2}$ .
16. Simplify  $-(49)^{3/2}$ .
17. Simplify  $(-49)^{3/2}$ .
18. Simplify  $(-8)^{1/3}$ .
19. Write the expression as 2 raised to a power containing  $n$ :  $\frac{\sqrt{2}}{4}2^n$ .
20. Combine the fractions over a common denominator:  $\frac{1}{x^2 - 3x} + \frac{2x}{x^2 - 9}$ .
21. Combine the fractions over a common denominator:  $\frac{y}{x^2 - xy} - \frac{y}{x^2 - y^2}$ .

22. Simplify:  $\frac{\frac{x^2+1}{1-\frac{1}{x}} - \frac{x^2+1}{1+\frac{1}{x}}}{x+\frac{1}{x}}.$
23. Compute  $e^{\ln 2 + \ln \frac{1}{2}}.$
24. Find the inverse function  $y = \frac{x}{x-1} + 1.$
25. Find the domain of the function  $f(x) = \frac{1}{\sqrt{x^2 - x - 2}}.$
26. Find the equation of the line that passes through the points (2,3) and (-11,1).
27. Solve the system of equations for  $x$  and  $y$ :  $2x + 5y = 7, \quad x + 3y = -4.$
28. Simplify and write the result using positive exponents:  $\frac{(-3x^2)^5 y^{-7}}{-9x^3 y^6}$
29. Simplify and write the result using positive exponents:  $4(x^{1/3} y^{2/5})^2 (-3y^{-3/5})^2 x^{-1/6}$
30. Simplify, canceling any common factors:  $\frac{\frac{x^2 - 2x}{x^2 - 4}}{\frac{x^3 - 3x^2}{x^2 - x - 6}}$
31. Simplify, canceling any common factors:  $\frac{\frac{a^3 - 2a^2b}{a^3 - 4ab^2}}{\frac{a^4 + 3a^3b}{a^2 + ab - 2b^2}}$
32. Simplify, canceling any common factors:  $\frac{6!3!}{5!0!}$
33. Simplify, canceling any common factors:  $\frac{(n+1)!(n-1)!}{n!(n+2)!}$
34. Complete the square to find the center and radius of the circle whose equation is  $x^2 - 4x + y^2 + 6y = 12.$
35. Simplify in terms of  $\cos x$  and  $\sin x$ :  $\frac{\sec x \cos^2 x \tan x}{\sin x \cot^2 x \csc^3 x}$
36. A right triangle has one side of length 3 and one side of length 7. What is the length of the hypotenuse?
37. Calculate  $\tan^{-1}(1)$
38. Calculate  $\tan^{-1}(\sqrt{3})$

39. Fill in and MEMORIZE the unit circle. Mark each angle with degrees and radians.



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40. Compute  $\lim_{x \rightarrow 0} \frac{\sin(3x) - \sin(5x)}{\sin(2x)}$

41. Compute  $\lim_{x \rightarrow \infty} \frac{4x + \sqrt{x^2 + 1}}{3x + 7}$

42. Compute  $\lim_{h \rightarrow 0} \frac{(x + h)^{50} - x^{50}}{h}$

43. Compute  $\lim_{n \rightarrow \infty} \frac{n!}{(n + 1)!}$

44. Compute  $\lim_{n \rightarrow \infty} \frac{3^n(n^5 - 16)}{3^{n+2}(n^4 - n^5)}$

45. Compute  $\lim_{x \rightarrow 4} \frac{x^2 - 3x - 4}{x^2 - 16}$

46. Compute  $\lim_{x \rightarrow 4^+} \sqrt{16 - x^2}$

47. Compute  $\lim_{x \rightarrow 4^-} \frac{1}{\sqrt{16 - x^2}}$

48. Compute  $\lim_{x \rightarrow 2} \frac{x^2 - 4}{\frac{1}{5} - \frac{1}{x+3}}$

49. Compute  $\lim_{x \rightarrow 3^+} \ln(x - 3)$

50. Compute  $\lim_{x \rightarrow 3^-} \ln(x - 3)$

51. Compute  $\lim_{x \rightarrow 3} \ln(x - 3)$

52. Compute  $\int_1^3 x^2 dx$

53. Compute  $\int_0^1 e^{3x} dx$

54. Compute  $\int_0^2 x^2 e^{x^3} dx$

55. Compute  $\int \frac{1}{y} dy$

56. Compute  $\int \frac{1}{y^2} dy$

57. Compute  $\int \frac{1}{2 - x} dx$

58. Compute  $\int \frac{x}{2 - x^2} dx$

59. Compute  $\int \frac{1}{x^2 + 1} dx$

60. Compute  $\int \frac{1}{2 + x^2} dx$

61. Compute  $\int (e^{2x} + e^{3x})^2 dx$

62. Compute  $\int \frac{7x + 3}{1 + x^2} dx$

63. Compute  $\int \frac{2x+3}{(x+1)^4} dx$
64. Compute  $\int \frac{e^{2x}}{1+e^{2x}} dx$
65. Compute  $\int \frac{(3 \ln x)^2 + 1}{x} dx$
66. Compute  $\int \cos x \sin x dx$
67. Compute  $\int \frac{\cos x dx}{\sin^2 x + 2 \sin x + 1}$
68. Compute  $\int \frac{x^2 + x}{\sqrt[3]{2 - 3x^2 - 2x^3}} dx$
69. Compute  $\int \sec x \tan x dx$
70. Compute  $\int \frac{(\sec x^{1/3})^2}{x^{2/3}} dx$
71. Compute  $\int_0^{182} 12 + \sin\left(\frac{\pi}{182}t\right) dt$
72. Compute  $\int_0^1 \frac{x \ln(x^2 + 1)}{1 + x^2} dx$
73. Compute  $\int (x+1)e^{(x^2+2x+5)} dx$
74. Compute  $\int \frac{1}{e^{2x}\sqrt{1-e^{-2x}}} dx$
75. What is wrong with the following:  $\int \frac{y}{dy} = \frac{y^2}{2} + C$ ?
76. What is wrong with the following:  $\int \ln y dy = \frac{1}{y} + C$ ?
77. Find the area of the region between  $y = 12 - x^2$  and  $y = x$  from  $x = 0$  to  $x = 2$ .
78. Find the area of the region in the first quadrant bounded on the left by  $y = x^2$ , on the right by  $x + y = 2$ , and above the  $x$ -axis.
79. Approximate the area under  $y = (x - \sin x)^2$  from  $x = 0$  to  $x = \pi$  using 2 rectangles and using the midpoints of each subinterval to obtain the rectangles' heights.