

MAT136 Calculus I: Algebra, Trigonometry, Sets, Functions, and Graphing 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 : $|x - 10| < 5$. Write your answer in set notation.

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 : $\frac{x + 4}{3 - x} \geq 0$. Write your answer in set notation.

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 and simplify: $\frac{1}{x^2 - 3x} + \frac{2x}{x^2 - 9}$.

21. Combine the fractions over a common denominator and simplify: $\frac{y}{x^2 - xy} - \frac{y}{x^2 - y^2}$.

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. Simplify and write the result using positive exponents: $\frac{(-3x^2)^5 y^{-7}}{-9x^3 y^6}$

25. Simplify and write the result using positive exponents: $4(x^{1/3} y^{2/5})^2 (-3y^{-3/5})^2 x^{-1/6}$

26. Simplify, canceling any common factors: $\frac{\frac{x^2-2x}{x^2-4}}{\frac{x^3-3x^2}{x^2-x-6}}$

27. Simplify, canceling any common factors: $\frac{\frac{a^3-2a^2b}{a^3-4ab^2}}{\frac{a^4+3a^3b}{a^2+ab-2b^2}}$

28. Complete the square to find the center and radius of the circle whose equation is $x^2 - 4x + y^2 + 6y = 12$.

29. Simplify in terms of $\cos x$ and $\sin x$: $\frac{\sec x \cos^2 x \tan x}{\sin x \cot^2 x \csc^3 x}$

30. A right triangle has one side of length 3 and one side of length 7. What is the length of the hypotenuse?

31. Fill in and KNOW the unit circle (there is one on the last page of this review to use if you like). Mark each angle with degrees and radians.

32. Without using a calculator or computer, evaluate the following:

(a) $\cos 210^\circ$ (b) $\sin \frac{5\pi}{4}$ (c) $\tan^{-1}(1)$ (d) $\sin^{-1}(-1)$
 (e) $\cos^{-1}(-1)$ (f) $\tan^{-1}(\sqrt{3})$ (g) $\cos \frac{9\pi}{4}$ (h) $\tan \frac{7\pi}{4}$

33. Graph the following functions by hand:

(a) $y = \sin(x)$ (b) $y = \sin(x+2)$ (c) $y = \sin(2x)$ (d) $y = 2\sin(x)$ (e) $y = \sin(x) + 2$

34. Graph the following functions on a typical xy -plane:

(a) $y = (x+5)^2 + 3$ (b) $x = \cos y$ (c) $y = 3x - 5$
 (d) $y = e^{x-2}$ (e) $y = \ln(x) + 1$ (f) $x^2 + (y+2)^2 = 9$

35. Rationalize the denominator: $\frac{4}{1-\sqrt{5}}$

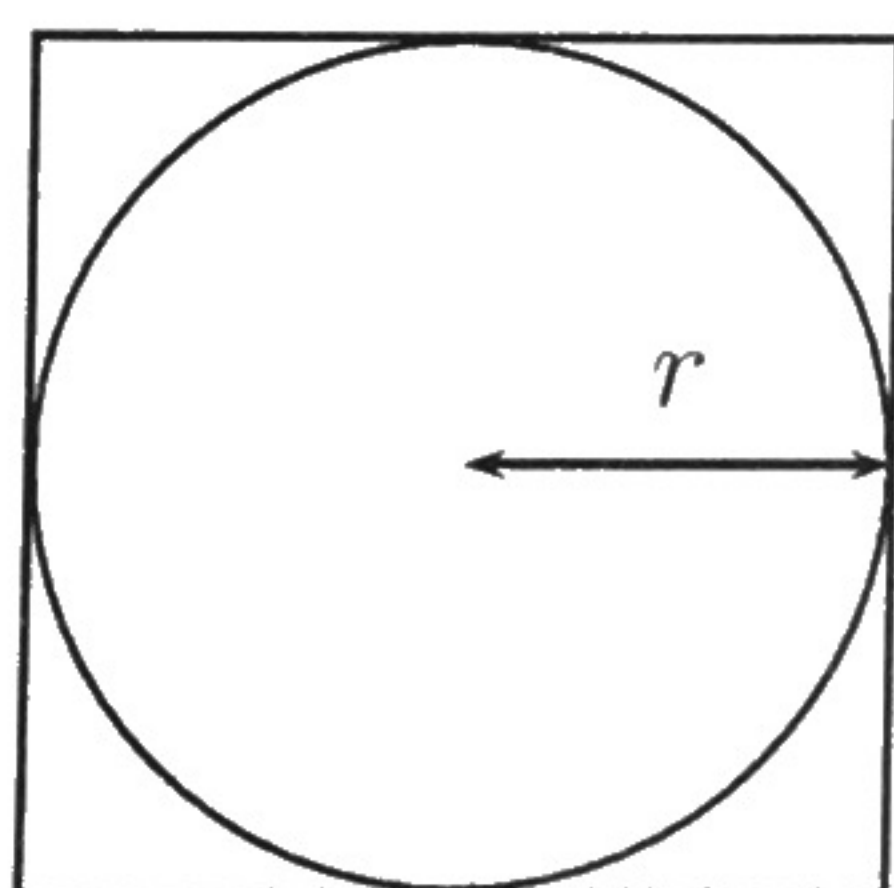
36. Solve for x without using a calculator or computer: $\log_2 x = 3$

37. Solve for x without using a calculator or computer: $\log_3 x^2 = 2\log_3 4 - 4\log_3 5$

38. Simplify $\log_{10}(10^{1/2})$

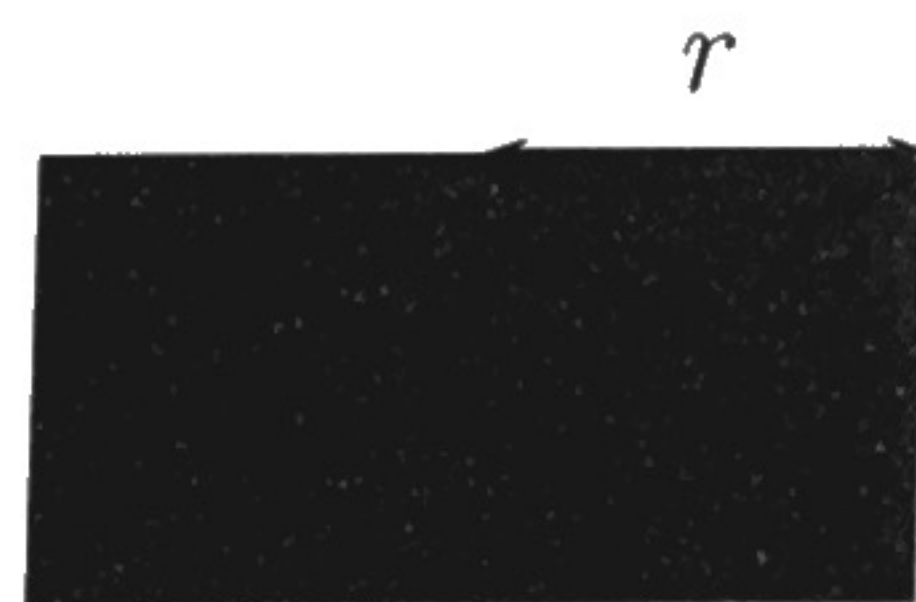
39. Solve for a : $V = 2(ab + bc + ca)$
40. Complete the square and reduce to the form $y - b = A(x - a)^2$: $y = x^2 + 4x + 3$
41. Determine an equation of the line through $(-1, 3)$ and $(2, -4)$.
42. Determine an equation of the line through $(-1, 2)$ and perpendicular to the line $2x - 3y + 5 = 0$.
43. Complete Exercise 1.7.1 on page 11 of the book.
44. Complete Exercise 1.5.4 on page 10 of the book.
45. Find the inverse function $y = \frac{x}{x-1} + 1$.
46. Find the domain of the function $f(x) = \frac{1}{\sqrt{x^2 - x - 2}}$.
47. Find the domain and range of the functions: (a) $f(x) = 7$, and (b) $g(x) = \frac{5x - 3}{2x + 1}$
48. State a function that does not have an inverse.
49. Complete Exercise 1.4.29 on page 8 of the book.
50. Find the ratio of the area inside the square but outside the circle to the area of the square in Figure (A)

(A)



51. Find the formula for the perimeter of a window of the shape in Figure (B).

(B)



52. A water tank has the shape of a cone (like an ice cream cone without ice cream). The tank is 10m high and has a radius of 3m at the top. If the water is 5m deep (in the middle) what is the surface area of the top of the water?
53. Two cars start moving from the same point. One travels south at 100 km/hour, the other west at 50 km/hour. How far apart are they two hours later?
54. A kite is 100m above the ground. If there are 200m of string out, what is the angle between the string and the horizontal. (Assume that the string is perfectly straight).