

MATH 0031 - ALGEBRA

SAMPLE FINAL EXAM

Exam length: 1 hour 50 minutes

INSTRUCTIONS:

1. NO TABLES, BOOKS, NOTES, HEADPHONES, CALCULATORS, OR COMPUTERS MAY BE USED.
2. Show ALL of your calculations and display answers clearly. You may leave your final answers in exact form. Unjustified answers will receive no credit.
3. WRITE YOUR SOLUTIONS in the space provided. EXTRA SPACE is available on the BACKS of the pages. When using these back pages, clearly LABEL the problem, and also clearly indicate on the appropriate front page where your back-page solution (or continuation of a solution) is located.
4. Write neatly. Cross out any work that you do not wish to be considered for grading.
5. Academic Integrity Strictly Applies. Looking at another person's paper is reason to assume cheating and your paper will be taken.
6. All Cell phones and electronic devices must be OFF and put away and hats removed.

1. Three points are given: $A = (-2, 2)$, $B = (2, 4)$, $C = (-4, 0)$
 - (a) (5 points) Find the midpoint D of the segment with endpoints B and C .

 - (b) (5 points) Write a slope-intercept equation of a line through A and B .

 - (c) (5 points) Write a slope-intercept equation of a line perpendicular to AB that passes through B .

 - (d) (5 points) Write an equation of a circle with center at A that passes through C .

2. (10 points) The width of a rectangle is 4 in. greater than half of the length, and the perimeter is 44 in. Find the width and the length of the rectangle.

3. (10 points) With a \$70 membership of Nice Valley orchestra one can buy tickets for \$15 per a concert. Tickets for non members are \$20. For what number of concerts is it cheaper to buy tickets with the membership? Use an inequality to solve the problem.

4. Given that $f(x) = \sqrt{x+1}$ and $g(x) = 2x - 6$ find each of the following
- (a) (5 points) $(f/g)(8)$.
- (b) (5 points) Domain of the function $(f/g)(x)$ in interval notation.
- (c) (5 points) $(f \circ g)(15)$.
- (d) (5 points) $(g \circ f)(15)$.
- (e) (5 points) value(s) of x such that $(g \circ f)(x) = 0$.

5. Determine whether the function is even, odd, or neither

(a) (5 points) $f(x) = x^2 - |x|$.

(b) (5 points) $f(x) = x^3 - |x|$.

6. Simplify. Write answers in the form $a + bi$, where a and b are real numbers.

(a) (5 points) $\sqrt{-49} - 4i^2 - 5i - \sqrt{49}$.

(b) (5 points) $\frac{1+i}{1-i}$.

7. (10 points) List all roots (real and complex) of the function $f(x) = (x^2 - 4x + 8)(x^2 - 4x + 3)$

8. (10 points) Solve the inequality $|3x + 6| < 15$ and write interval notation for the solution set. Then graph the solution set.

9. (10 points) Find the formula for the inverse function of $f(x) = \frac{3^{2x} + 7}{4}$ and its domain.

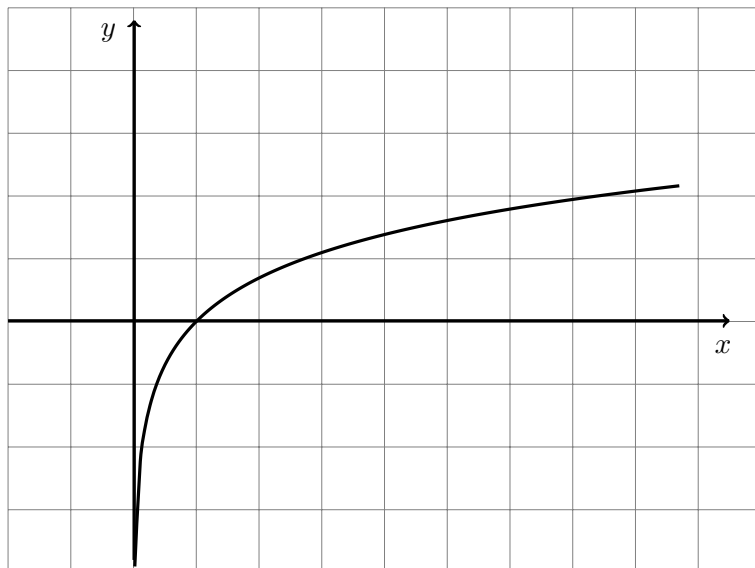
10. (10 points) Solve the inequality $\frac{x + 2}{x^2 - 3x} > 0$

11. In a certain year, a total of 4 million passengers took a cruise vacation. The global cruise industry has an exponential growth rate of 6% per year.

(a) (5 points) Find the exponential growth function.

(b) (5 points) In how many years the number of passengers will double? Leave your answer in exact form.

12. (15 points) The graph of $f(x) = \ln x$ is shown. On the same axis given, use transformations to sketch the graph of $g(x) = 1 - \ln(x - 1)$. Describe how the graph of $g(x)$ was obtained from the graph of $f(x)$.



13. (10 points) Simplify the equation $3 \log_2 x + 4 - \log_2(8x^2) = 0$ and solve it for x .

14. The Coffee Shoppe sells a coffee blend made from two coffees, one costing \$5/lb and the other costing \$7/lb. The blended coffee sells for \$5.60/lb. The weight of the blended coffee is 100 lbs. Find how much of each coffee in pounds is used to obtain the desired blend.

(a) (5 points) Formulate the problem as a system of linear equations.

(b) (5 points) Solve the system using the elimination method.

15. For the given system of equations

$$\begin{aligned}x - 2y &= -1 \\ -2x + 5y &= 4\end{aligned}$$

(a) (5 points) Write an equivalent matrix equation.

(b) (5 points) Find an inverse matrix.

(c) (5 points) Solve the system by using the inverse matrix.

16. (15 points) Graph the solution set of the system.

$$\begin{aligned}x + y &\geq 3 \\ -2x + y &> 0\end{aligned}$$

