

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. Given the points $A = (2, 8)$ and $B = (10, 14)$,

(a) (5pt) Determine the midpoint C .

(b) (10pt) If the line segment connecting A and B is the diameter of a circle, determine the equation of the circle.

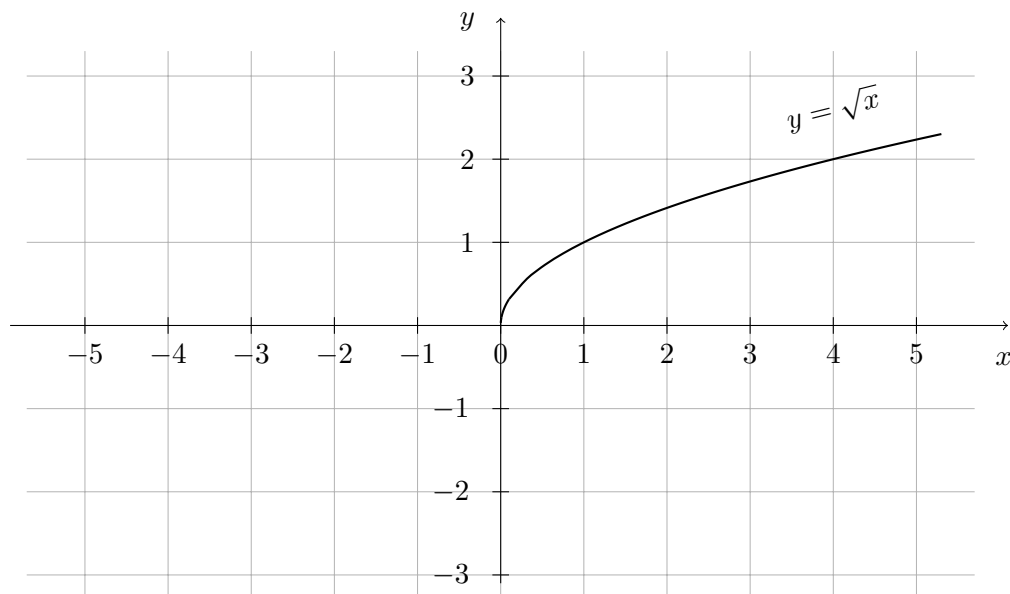
(c) (5pt) Determine the equation of line having points A and B .

(d) (5pt) Determine the equation of the line perpendicular to the diameter AB which passes through the center of the circle.

2. (10pt) For the function $f(x) = x^2 + 2x - 3$, construct and simplify the difference quotient

$$\frac{f(2+h) - f(2)}{h}.$$

3. (10 pt) The graph of $f(x) = \sqrt{x}$ is shown. On the same axis given, use transformations to sketch the graph of $g(x) = 1 - \sqrt{x+3}$



4. (10pt) Using the Rational Root Theorem, list all possible rational solutions to the equation $2x^3 + 3x^2 - 11x - 6 = 0$, then find the actual solutions.

5. (5pt) Determine the polynomial function $f(x)$ of degree 4 with $x = -2$ and $x = 3$ zeros of multiplicity one and having $x = 1$ as a zero of multiplicity 2, such that $f(0) = \frac{1}{2}$.

6. (5pt each) Write in the form $a + bi$

(a) $(-3 + 7i)(4 - 5i)$

(b) $\frac{3 + 2i}{5 + i}$

7. (5pt each) Solve the given equation.

(a) $x^2 + 2x = 3$

(b) $3t^2 + 4t - 2 = 0$

8. (10pt) Determine all solutions to

$$\sqrt{3x - 1} = 2x + 3$$

9. (10pt) Determine all solutions to

$$\frac{x}{x + 4} + \frac{2}{x - 4} = 1$$

10. (5pt) Solve the inequality:

$$|3x - 2| \leq 8$$

11. (5pt) Solve the polynomial inequality:

$$x^2 + 3x + 2 \geq x^3 + x + 2$$

12. (5pt) Determine the inverse of the one-to-one function, $f(x) = \frac{2x + 1}{x - 3}$.

13. (5pt) Simplify: $\log_2(\sqrt{32})$

14. (10pt) If $\ln(a) = 2.2$, and $\ln(b) = 1.8$ and $\ln c = 1.4$, determine $\ln\left(\sqrt{\frac{a^2 b}{c}}\right)$

15. (10pt) Sketch the graph of $f(x) = 10 - 2e^{-x}$. Mark carefully any intercepts and/or asymptotes.

16. (10pt) Determine all solutions: $\log_{10}(2x + 1) - \log_{10}(x - 2) = 1$

17. (10pt) Solve the linear system of equations

$$\begin{array}{rclcl} x & + & 2y & - & 3z & = & 1 \\ 2x & + & 3y & + & z & = & 6 \\ 3x & - & y & - & z & = & -10 \end{array}$$

18. (10pt) Sheila has a total of \$1000 invested in two different accounts. One account yields 2.4% annual interest and the other yields 2% annual interest. Her total annual interest is \$22.50. How much does she have in each account?

19. (15pt) Graph the system of inequalities and then find the coordinates of the vertex.

$$\begin{aligned}y &\geq 2x - 3 \\y &\leq 3 - 4x\end{aligned}$$

20. (15pt) Given the function $f(x) = \frac{x-1}{x^2-4}$,

(a) Find and label all asymptotes

(b) Find the x and y intercepts.

(c) Graph the function