

Final Exam
Math 119
May 12, 2004

Name _____

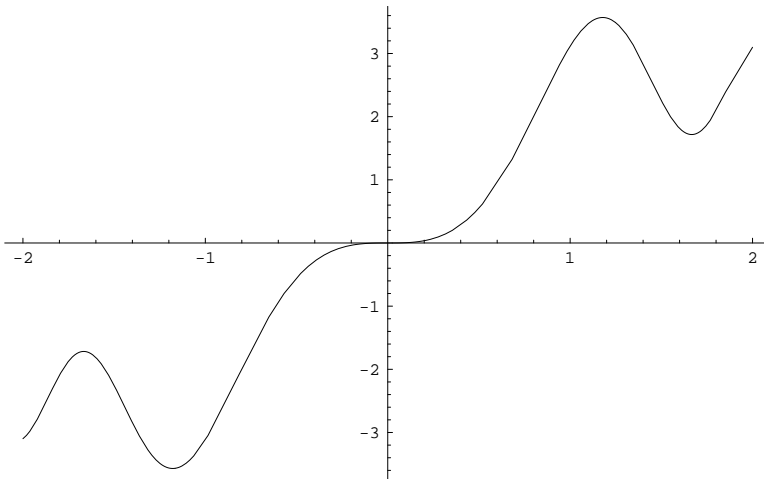
All questions are worth an equal number of points. All work is to be done on the blank paper provided. At the end of the exam, please hand in this sheet, together with all of your work.

§1 Calculation

1. Below is the graph of a function $y = f(x)$. Plot the graphs of

- a. $y = \frac{1}{2}f(x)$,
- b. $y = f(x) + 1$, and
- c. $y = f(x + 1)$.

On each graph carefully indicate the function, the axes, and the scale.



2. Solve the following inequalities exactly.

- a. $|\frac{2}{3}x + 1| \geq 2$,
- b. $-3 < 7 - 2x \leq 7$.

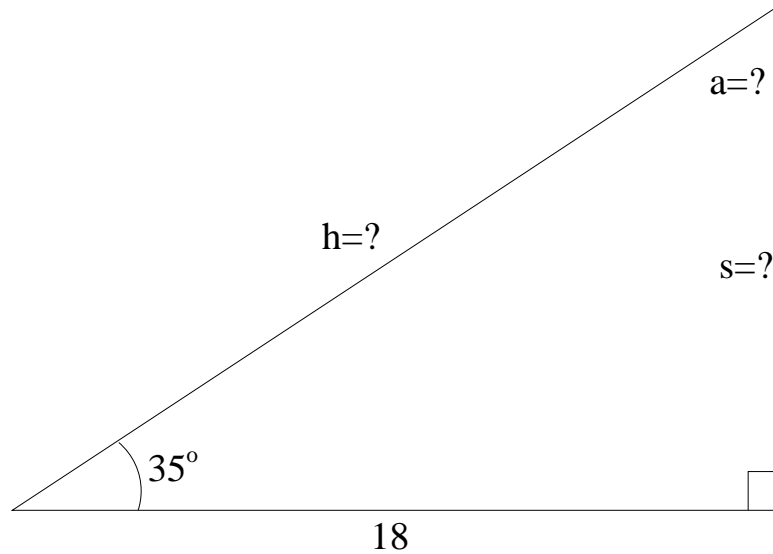
3. Solve $\sqrt{2x + 3} - \sqrt{x - 2} = 2$.

4. Solve $x^4 + 4x^3 + 10x^2 + 12x + 5 = 0$.

5. Evaluate or simplify each of the following.

- a. Simplify $e^{\ln(2x)}$.
- b. Evaluate exactly $\log_4 8$.
- c. Simplify $\log_b \left(\frac{m}{n}\right)^{3/5}$.
- d. Give an approximate value of $\log_7 44$, accurate to three digits.

6. A right triangle is shown below. Find the all of the angles and all of the lengths.



7. Verify the identity $\cot \theta - \tan \theta = \frac{2 \cos^2 \theta - 1}{\sin \theta \cos \theta}$.

8. Find exact solutions for $\sin^2 x = \frac{1}{2} \sin 2x$, for $0 \leq x < 2\pi$.

9. For each of the following equations,

- determine if the equation represents a parabola, ellipse, or hyperbola,
- identify the focus or foci, vertex and directrix as appropriate, and
- sketch a graph.

a. $x^2 + 9y^2 = 81$,

b. $x^2 - 9y = 81$,

c. $x^2 - 9y^2 = 81$.

§2 Comprehension

10. What is the slope of a line? What is the slope-intercept form of a line? What is the point-slope form of a line?

11. What is the fundamental theorem of algebra? Write a polynomial whose zeros are -2 , 0 , and 1 , where the zero -2 has multiplicity 3, the zero 0 has multiplicity 2, and the zero 1 has multiplicity 1.

12. What is the quadratic formula? Use completing the square to prove that it is true.

13. What is the definition of $\sin \theta$ and $\cos \theta$? Use your definition to prove that $\sin^2 \theta + \cos^2 \theta = 1$ for all θ .

14. What is the definition of $\sin^{-1} x$? Evaluate exactly

a. $\sin(\sin^{-1} x)$,

b. $\cos(\sin^{-1} x)$,

c. $\sin(2 \sin^{-1} x)$.

§3 Application

15. An appliance salesperson receives a base salary of \$200 a week, and a commission of 4% on all sales over \$3,000 during the week. In addition, if the weekly sales are over \$8,000, the salesperson receives a \$100 bonus.
 - a. Write a function that describes the amount of money that the salesperson earns as a function of sales.
 - b. Sketch the graph of the function.
 - c. Identify any points of discontinuity.
 - d. How much money does the salesperson make on sales of \$5,570? On sales of \$9,200?
16. A 1,200 square foot garden is enclosed with 150 feet of fencing. Find the dimensions of the garden to the nearest tenth of a foot.
17. A student entering college takes on \$15,000 of student loan debt at an annual interest rate of 6%, compounded monthly. If the student does not have to make payments for four years, how much will the student owe at the end of this time? Assuming no payments are made, how long will it take for the amount owed to double?
18. A wall clock has an hour hand that is 6 inches long, and a minute hand that is 12 inches long. What is the distance between the hour hand and minute hand at 1:00? at 3:30?