

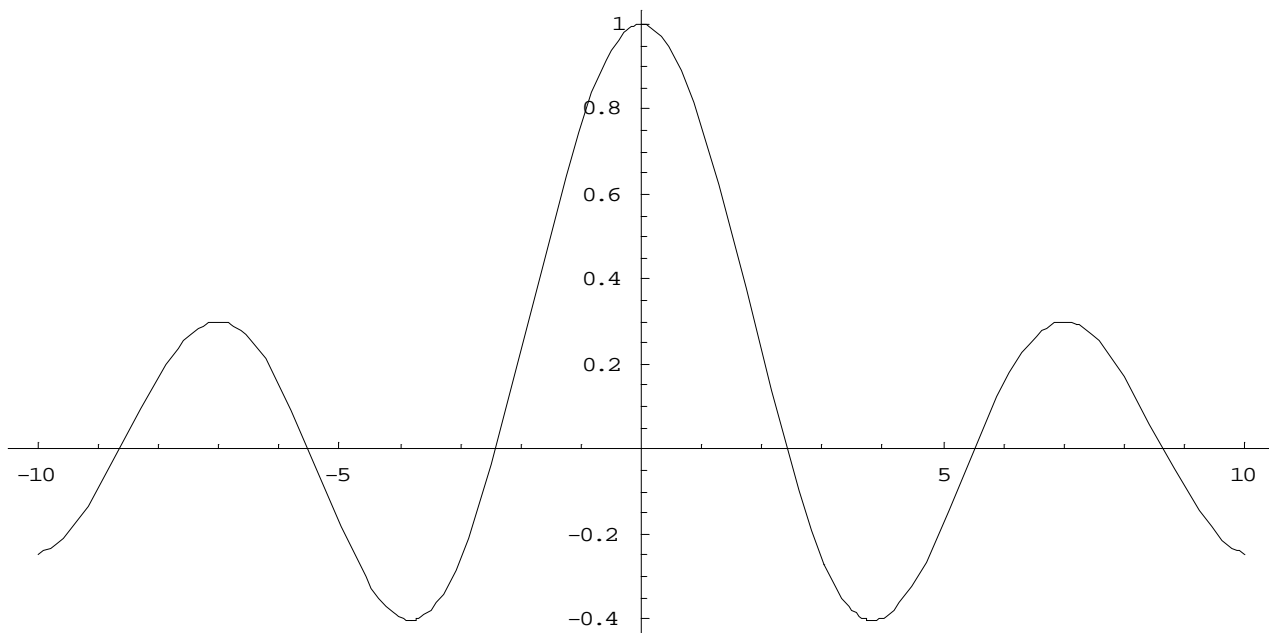
Midterm Exam
Math 273
February 21, 2001

Name _____

Do all of your work on the blank paper provided. At the end of the exam, hand in your answers with this cover sheet. Include your name on all pages of your exam.

§1 Calculation

1. Find the domain of $f(x) = \frac{x^2 + 5x + 6}{x + 2}$. Give an accurate graph.
2. The graph of $f(x)$ is shown. Draw a graph of $f(2x) + 1$. Include an accurate scale on your graph!



3. Use a graph to determine which of the following functions are one-to-one. Show your graph.
 - a. $f(x) = x^3 + x$
 - b. $f(x) = x^3 - x$
 - c. $f(x) = x^3$
4. Find the inverse of function $f(x) = \frac{1+3x}{5-2x}$. Find the domain and range of $f(x)$ and the domain and range of $f^{-1}(x)$.

§2 Comprehension

5. Give a precise definition of function. Give an example of an even function and an odd function.
6. Give a precise definition of what it means for a function to be increasing on an interval.

7. What is a rational function?

8. What is the definition of the function $f(x) = \log_a x$? Prove for any positive $a \neq 1$ that $\log_a x = \frac{\ln x}{\ln a}$

§3 Application

9. An airplane is flying at a speed of 350 mi/hr at an altitude of one mile and passes directly over a radar station at time $t = 0$ where time t is measured in hours.
- Express the horizontal distance d that the plane has traveled as a function of t .
 - Express the distance s between the plane and the radar station as a function of time t .
 - Use composition to express s as a function of d .
10. The *half-life* of strontium 90, ^{90}Sr is 25 years, which means that half of any given quantity of ^{90}Sr will disintegrate in 25 years.
- If a sample of ^{90}Sr has a mass of 24 mg, find an expression for the mass $m(t)$ which remains after t years.
 - How much time (exactly!) would it take for the mass to be reduced to 5 mg?