

Midterm Exam #1

Math 273

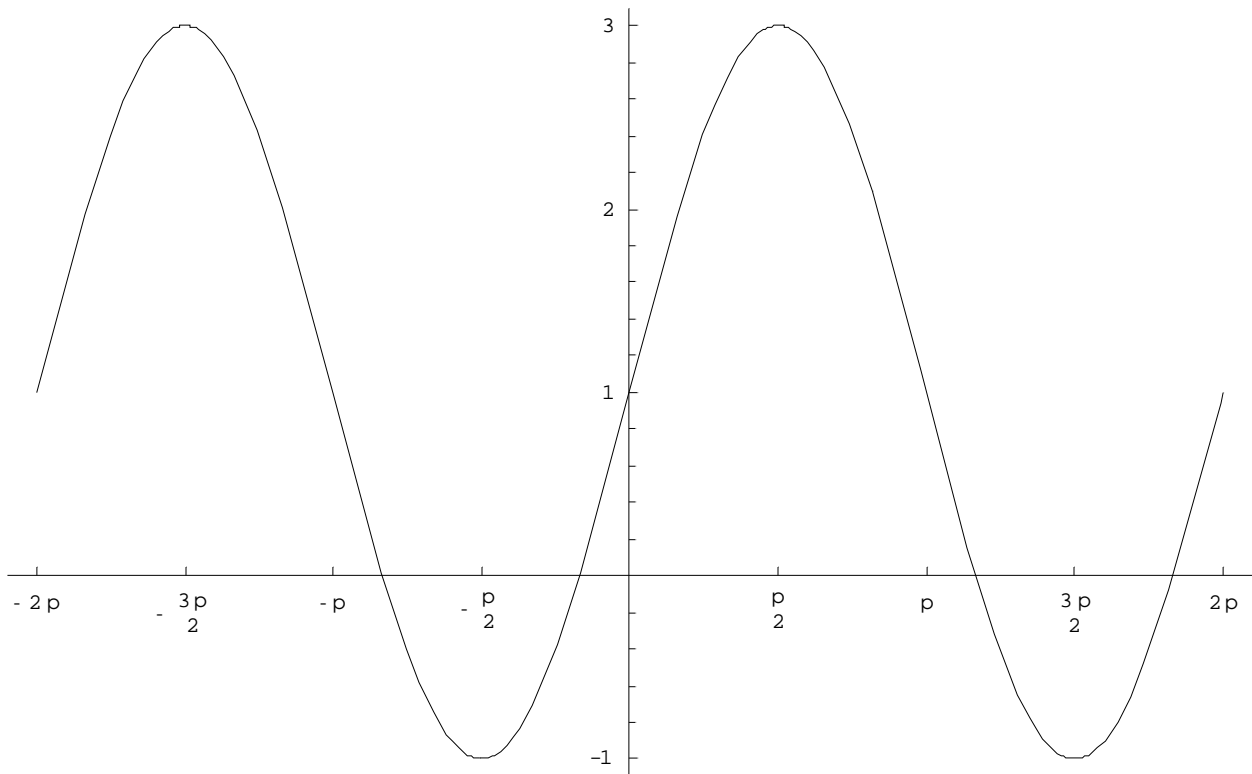
February 20, 2002

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. Let $f(x) = 2x^2 - 2$ and $g(x) = 3x + 2$. Find $f \circ g$ and $g \circ f$, and their domains.
2. The graph of a function $f(x)$ is given below. It is obtained by dilating and translating the function $g(x) = \sin x$. Give a formula for $g(x)$ in terms of $f(x)$.



3. Let $f(x) = \frac{1+3x}{2-5x}$. Find $f^{-1}(x)$.
4. Estimate $\lim_{x \rightarrow 0} \frac{\sin x}{x}$. Explain your method.
5. Let $f(x) = \frac{x^2}{x^2 - x}$. Give a good graph of $f(x)$ that indicates all of the important features. What is the domain of f ? Identify all of the vertical asymptotes.

§2 Comprehension

6. What is the definition of a function? Explain the importance of domain and range. What is a polynomial function? What is a rational function.
7. Does the function $f(x) = \sin x$ have an inverse? Why or why not. How is the function $g(x) = \sin^{-1} x$ defined? What is the domain and range of $g(x)$?
8. Give the informal definition of limit.

§3 Application

9. Express the surface area of a cube as a function of its volume.
10. Under ideal conditions, a certain bacteria population is known to double every three hours. Suppose that initially there are 100 bacteria.
 - a. What is the size of the population after 15 hours?
 - b. What is the size of the population after 20 hours?
 - c. What is the population after t hours?
 - d. How long will it be before the population reaches 50,000?