Math 13   **Exam 1**   Name: _____

21 September 1998   100 Points
"Show enough work to justify your answers."
No calculators or computers!

1. Let $f(x) = x^2$. Define the function m for $x \neq -1$ by letting $m(x)$ be the slope of the line intersecting the graph of f at $(-1, 1)$ and $(x, f(x))$. Find a formula for $m(x)$ and simplify. (10 points)

2. Suppose that the function f takes a maximum value of 10 at $x = 3$ and a minimum value of 2 at $x = 8$. Let $g(x) = -2f(x + 4) + 3$. What is the maximum value of g and where does it occur? Briefly explain. (10 points)

3. If $|x - 8| < 3$, find two numbers L and U so that $L < x < U$. (6 points)

4. Simplify the following. (6 points each)
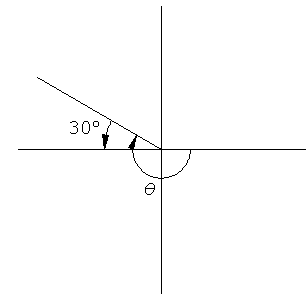   a) $\log_3 \frac{1}{9}$
   b) $\ln e^5$
   c) $8^{\log_2 5}$ (Hint: $8 = 2^3$)

5. Let θ be the pictured angle.
   a) What is the radian measure of θ? (5 points)
   b) What are $\sin \theta$ and $\cos \theta$? (6 points)

6. The pictured graph (below left) is the graph of $f(x) = A\sin(x + B) + C$ for some constants A, B, and C. Determine the values of A, B, and C. (10 points)

7. Let $f(x) = \dfrac{x}{x - 2}$.
   a) What is the domain of f? (5 points)
   b) Find the formula for $f^{-1}(x)$. (10 points)
   c) What is the domain of f^{-1}? (5 points)
   d) How is the range of f related to the domain of f^{-1}? (5 points)

8. Find the piecewise formula for the pictured function (below right). (10 points)