Math Diagnostic Test **Econ 103**

Name: _____

Score: _____ /50

Instructions: You will have 25 minutes to complete this test. As this is merely a diagnostic test, your score will not be factored into your course grade.

1. Evaluate each of the following expressions.

   (a) [1 point] $5!$

   (a) _____

   (b) [2 points] $\dfrac{100!}{98!}$

   (b) _____

   (c) [2 points] $\binom{5}{3}$

   (c) _____

2. True or False?

   (a) [2 points] $\sum_{i=1}^{n}(x_i/n) = (\sum_{i=1}^{n} x_i)/n$

   (a) _____

   (b) [2 points] $\sum_{k=1}^{n} x_k z_k = z_k \sum_{k=1}^{n} x_k$

   (b) _____

   (c) [2 points] $\sum_{k=1}^{m} x_k y_k = (\sum_{k=1}^{m} x_k)(\sum_{k=1}^{m} y_k)$

   (c) _____

   (d) [2 points] $(\sum_{i=1}^{n} x_i)(\sum_{j=1}^{m} y_j) = \sum_{i=1}^{n}\sum_{j=1}^{m} x_i y_j$

   (d) _____

   (e) [2 points] $(\sum_{i=1}^{n} x_i)/(\sum_{i=1}^{n} z_i) = \sum_{i=1}^{n}(x_i/z_i)$

   (e) _____

3. [5 points] Suppose that $-c < (a - x)/b < c$ where $b > 0$. Find a lower bound L and an upper bound U such that $L < x < U$.

4. Let $f(a) = (x - a)^2 + (y - a)^2$ where x and y are constants.
   (a) [5 points] What value of a minimizes $f(a)$?

   (b) [5 points] How can you be sure this is a minimum rather than a maximum?

5. Imagine a rectangle whose base is the x-axis and whose bottom left corner is the origin $(0, 0)$. Suppose its area is 1 and the length of its base is 3. The area of this rectangle can be expressed as the definite integral of a function $f(x)$ from a to b.
   (a) [3 points] What is the function f?

   (b) [2 points] What are the limits of integration (a, b)?

6. [5 points] Solve $\int_0^2 cx^2\,dx = 1$ for c. Your answer should not involve x.

7. [5 points] Let $z = \sum_{i=1}^{n}(y_i - a - bx_i)^2$. Evalulate $\partial z/\partial b$.

8. [5 points] Let $F(x) = \int_a^x f(t)\,dt$. Express the derivative $F'(x)$ in terms of f.