Practice Test 2

Dupuy —Math 150 —Summer 2008

July 8, 2008

1. Find the average slope of the function $f(x) = x^2 + 3x + 1$ on the interval $[0, 1]$.

2. Find the average slope of the function $f(x) = 2^x + x^2$ on the interval $[2, 3]$.

3. Let $f(x) = xe^x$. You'll need the information that $f(x)$ has a minimum at $x = -1$ to solve the following problem.

   (a) Graph $f(x)$.

   (b) Restrict the domain of $f(x)$ to $(-1, \infty)$. Using the graph of $f(x)$, graph its inverse.

   (c) What is the domain of $f^{-1}(x)$?

4. Assume the following functions are real valued. Find the maximal domain of definition for the function and find the image of the functions.

   (a) $f(x) = x^3$.

   (b) $f(x) = \sqrt{x + 2}$.

   (c) $f(x) = \frac{1}{\sqrt{x+2}}$.

   (d) $f(x) = \frac{1}{x} + \sqrt{x + 1}$.

5. Determine which functions are even or odd or neither. Show your work

   (a) $f(x) = x^2 + 2$.

   (b) $f(x) = 5$.

   (c) $f(x) = 2^x + 2^{-x}$.

   (d) $f(x) = 2^x + 1$.

6. Compute the difference quotient for $f(x) = x^3 + x^2 + x + 1$.

7. Let $z_1 = -1 + i$ and $z_2 = \sqrt{3} + i\sqrt{3}$.

   (a) Plot z_1 and z_2 in the complex plane.

   (b) Convert z_1 and z_2 to polar coordinates.

   (c) Multiply z_1 and z_2, then plot $z_1 z_2$ in the complex plane.

8. Let $f(x) = \frac{x^2 + 2x - 15}{x^2 + 2x}$. Find the x-intercepts, y-intercepts, vertical asymptotes and horizontal asymptotes. Make a complete graph of the function.

9. Solve for x:
$$e^{2x} - 4e^x + 4 = 0.$$

10. Graph the function
$$f(x) = \begin{cases} x, & x < 0 \\ \sqrt{x}, & 0 \le x < 1 \\ x^3, & x \le 1 \end{cases}$$

11. What is wrong with $f(x)$ in the following definition:

$$f(x) = \begin{cases} 2, & x \leq 0 \\ x, & 0 \leq x \leq 2 \\ x^2/2, & 2 \leq x \end{cases}$$

12. (Extra Credit)

    (a) Explain how to enumerate (list) all the rational numbers in between 0 and 1.

    (b) Explain why you can't number off all the real numbers in between 0 and 1.