CIS-280
Assignment 1: Basic Concepts and Recursion: 10 pts. each
Due Tuesday, February 22, 2005

1. Replace expression1, expression2, expression3, and expression4 with appropriate Scheme expressions to complete the definition of a procedure EndOnes that takes three numbers as arguments and returns the sum of the cubes of the largest and smallest numbers. You must design the procedure as shown below, just filling in expression1, expression2, expression3, and expression4. Note that expression1 will be another cond expression, thus providing an example of nested conditionals.

(define EndOnes (lambda (x y z)
    (cond ((>= x y) expression1)
          ((>= x z) expression2)
          ((>= y z) expression3)
          (else expression4))))

2. Define and test a recursive procedure (ith-digit num i) that takes as arguments a positive integer num and a non-negative integer i, and returns the digit of num that is in position i where the rightmost digit is viewed as in position 0. Thus

(ith-digit 37562798 4) returns 6

3. Define a recursive procedure (SumAlt n) that returns the sum of every other digit in its argument n, beginning with the digit in the units position. So for example, (SumAlt 425638) will return 16 (the sum of 8, 6, and 2).

4. The funnynumbers are 1,2,8,22,11,47,13,...
   The first number is 1 and the second is 2; for n > 2, the n-th funnynumber can be computed as the square of n minus the absolute value of the difference between the two preceding funnynumbers if n is odd, and as the square of n plus the absolute value of the difference between the two preceding funnynumbers if n is even. For example, the 5th funnynumber is $5^2 - |(22 - 8)|$, and the 6th funnynumber is $6^2 + |(11 - 22)|$. Design and test a recursive Scheme procedure (funnynumber n) that takes a positive integer n as argument and returns the n-th funnynumber.

5. Define a recursive procedure (SimilarDigits num1 num2) that takes as arguments two positive integers num1 and num2, and returns true if the corresponding digits of num1 and num2 are either both even or both odd, and returns false otherwise. For example,

(SimilarDigits 7873564 5619522) returns true
(SimilarDigits 1133 9999) returns true
(SimilarDigits 2342 6425) returns false

6. Define a recursive procedure (SumDigits num1 num2) that takes as argument two positive integers num1 and num2 and returns the sum of the product of the corresponding digits. For example,

(SumDigits 345 221) returns 19
(SumDigits 3785 28) returns 56
(SumDigits 332 445233) returns 21

Place your procedures in a single file, copy them into the submission web page, and submit them for grading.