

Name: \_\_\_\_\_

**CSCI 2824 - Discrete Structures**  
**Final Exam - Part 1**

Grade: \_\_\_\_\_ /100

1. (12 points) Add the following numbers without converting to base-10.

(a)  $1101_2 + 101100_2 + 110110101_2$

(b)  $0xA03_{16} + 0x4B07A_{16}$

(c)  $0x1E9_{16} + 1101101_2$

2. (12 points) Decompose the following function

(a) Into three functions,  $f, g, h$  such that the given function is  $f \circ g \circ h$ .

$$\log_2(x^2 + 2)$$

(b) Into three functions  $f, g, h$  such that the given function is  $f \circ g \circ h$ .

$$(3 + \sin(x))^4$$

(c) Into four function  $f, g, h, j$  such that the given function is  $f \circ g \circ h \circ j$ .

$$\frac{1}{(\cos(6x))^3}$$

3. (20 points) Determine whether the following are equivalence relations on the set of all people.

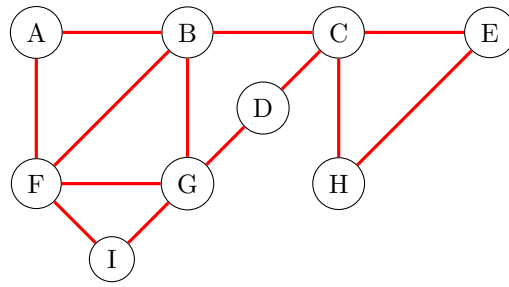
(a) For people  $x, y$ ,  $(x, y) \in R$  if  $x$  and  $y$  have the same height.

(b) For people  $x, y$ ,  $(x, y) \in R$  if  $x$  and  $y$  have at some time lived in the same country.

4. (26 points) For the following questions, consider the numbers 5 through 200 inclusive.
- (a) How many numbers consist of distinct digits? (123 consists of distinct digits, whereas 11 does not)

(b) How many do not contain the digit 0?

5. (30 points) Find an Euler tour for this graph:



You may write your solution either as a sequence of nodes or REDRAW the graph with numbered edges to indicate order.