MATH 155 – Practice Test 1

September 26, 2017 **Name:** Solution Set

Instructor: Patricia Wrean

Total: 40 points

1. (7 points) Convert the following numbers into the indicated base. You do not need to show any work.

   (a) 1010_2 to decimal $= 1\times2^3+0\times2^2+1\times2^1+0\times2^0 = 8+0+2+0=10$ — 10 (or 10_{10})

   (b) 12_{10} to octal can divide by 8, or just say $12 = 8+4$, 10_8 — 14_8

   (c) 73_8 to hexadecimal — $3B_{16}$

   $73_8 = 111\ 011 = \underbrace{11}_{3}\ \underbrace{1011}_{11=B}$

   (d) 12_{10} to hexadecimal — C_{16}

   (e) 7_{10} to binary — 111_2

   (f) 1110_2 to octal $= \underbrace{1}_{1}\ \underbrace{110}_{6}$ — 16_8

   (g) 35_7 to decimal $= 3\times7+5=26$ — 26 (or 26_{10})

2. (2 points) Is the number 1799_8 exist? Is this a legal number in octal? Explain briefly.

   no, the digits in octal go from 0 to 7.

   9 is not an allowed digit

3. (10 points) Convert the following numbers into the indicated base. Show your work.

(a) 647_8 to hexadecimal

$1A7_{16}$

$647_8 = \underbrace{110}_{6}\ \underbrace{100}_{4}\ \underbrace{111}_{7}$

$= 1\ 1010\ 0111$

$= 1A7$

no work (-2)

no base (-½)

3

(b) 395_{10} to hexadecimal

$18B_{16}$

	Q	R
$395 \div 16$	24	$11 = B$
$24 \div 16$	1	8
$1 \div 16$	0	1

no work (-3)

no base (-½)

4

(c) 2016_8 to decimal

1038 (or 1038_{10})

$2016_8 = 2 \times 8^3 + 0 \times 8^2 + 1 \times 8^1 + 6 \times 8^0$

$= 1038$

no work (-2)

3

4. (4 points) Let p denote "John took the bus to work" and q denote "John walked home" Rewrite the following English sentences in terms of logical symbols (i.e. $p \wedge q$, $p \vee q$). Do not simplify!

   (a) John walked home or he didn't take the bus to work. $q \vee \bar{p}$

   (b) Either John didn't take the bus to work or he didn't walk home but not both. $\bar{p} \oplus \bar{q}$

   (c) It is not true that John both took the bus to work and walked home. $\overline{p \wedge q}$

   (d) John walked home or he didn't walk home. either $q \vee \bar{q}$ or $q \oplus \bar{q}$

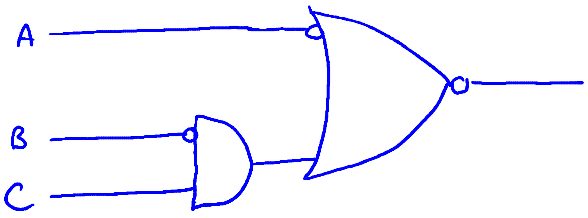
5. (3 points) Answer the following questions by circling the correct choice.

   (a) Natasha blogs daily or answers her email. Does she blog daily? Yes / No / Maybe
   one or the other or both

   (b) Frank ordered soup and salad. Did he order soup or salad? Yes / No / Maybe
   both

   (c) The cookie contains raisins. Does it contain raisins and oatmeal? Yes / No / Maybe

6. (4 points) Draw the gate diagram that corresponds to the Boolean expression $\overline{\overline{A} + \overline{B}C}$. Do not simplify!



(-1) for each mistake (so -2 for mixing up "and" and "or")

(-2) for really screwing up the negations

7. (5 points) Is the Boolean expression $A + \overline{A + B}$ logically equivalent to $\overline{A}(B + 1)$? Use a truth table to justify your answer.

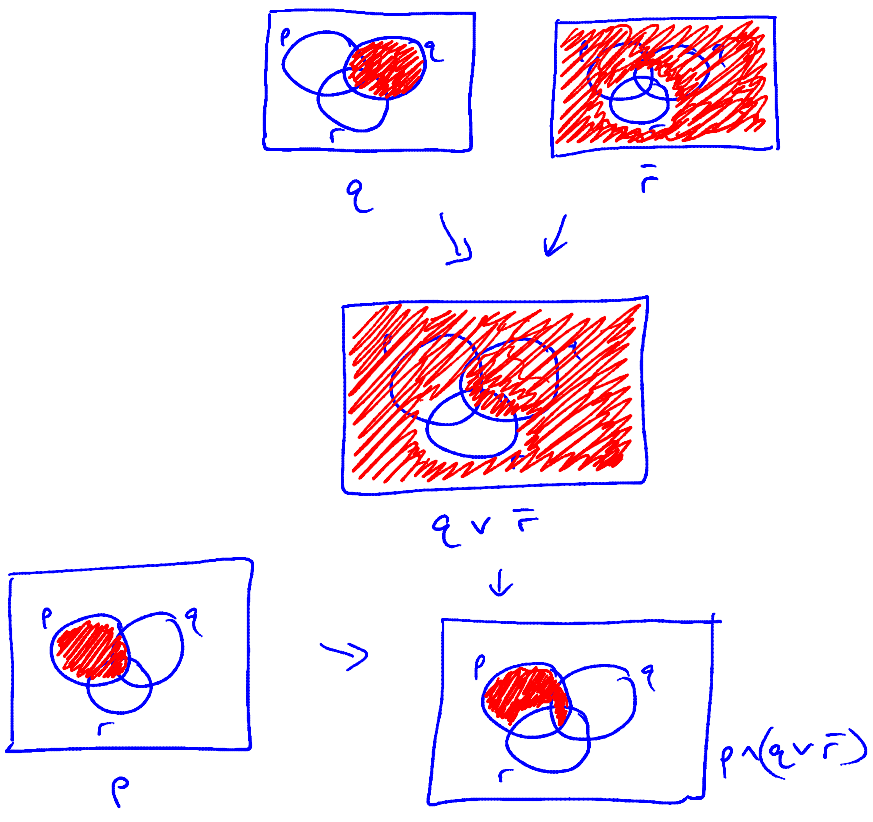
A	B	$\overline{A}$	1	$A+B$	$\overline{A+B}$	$A+\overline{A+B}$	$B+1$	$\overline{A}(B+1)$
0	0	1	1	0	1	1	1	1
0	1	1	1	1	0	0	1	1
1	0	0	1	1	0	1	1	0
1	1	0	1	1	0	1	1	0

not same

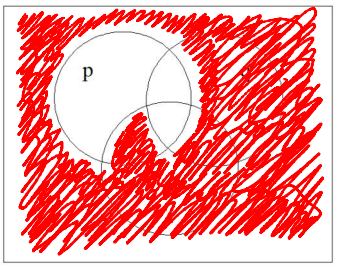
(-½) per incorrect entry
(-1) for entire column
(-1) no conclusion

NO

8. (5 points) Represent $\overline{p \wedge (q \vee \overline{r})}$ on the following Venn diagram by shading in the appropriate regions. Show intermediate steps on separate sketches and label them clearly to get full credit.



(-4) no intermediate work
(-1) each mistake for max of (-2) per diagram



$\overline{p \wedge (q \vee \overline{r})}$