| Math 102<br>Exam #2<br>Spring 2009 | *Show all work (and answers) on the blank paper provided. Write only your name on this paper.* | Name: |
|---|---|---|

| | | |
|---|---|---|
| 1a | 10 | |
| 1b | 10 | |
| 1c | 10 | |
| 1d | 10 | |
| 1e | 10 | |
| 1f | 10 | |
| 1g | 10 | |
| 1h | 10 | |
| 2 | 30 | |
| 3 | 30 | |
| 4 | 30 | |
| 5 | 30 | |
| 6a | 5 | |
| 6b | 5 | |
| 6c | 5 | |
| total | 215 | |
| Adj. | | |
| % | | |

**1)** Compute the following in the indicated base:

**a.** $37A6_{12} + B54_{12}$
**b.** $2113_4 - 233_4$
**c.** $E929_{16} - 8FA8_{16}$
**d.** $562_7 \times 4_7$
**e.** $314_5 \times 42_5$
**f.** $152_6 \div 4_6$ (stop when remainder is 0)
**g.** $236_8 \div 7_8$ (identify a repeating pattern)
**h.** $4032_5 \div 21_5$ (stop at $5^{-2}$ place value)

**2)** Determine which of the five properties of a commutative group hold in the mathematical system consisting of the **even integers** $\{\ldots,-6,-4,-2,\ 0,\ 2,\ 4,\ 6,\ldots\}$ under **subtraction**. If a property fails, give a counterexample. If a property holds, explain why.

**3)** Determine which of the five properties of a commutative group hold in the mathematical system consisting of the irrational numbers under multiplication. If a property fails, give a counterexample. If a property holds, explain why.

**4)** For the given system determine which of the five properties of a commutative group hold.

| $\boxdot$ | a | b | c |
|---|---|---|---|
| a | b | a | c |
| b | c | b | a |
| c | a | c | b |

**5)** For the given system determine which of the five properties of a commutative group hold.

| $\divideontimes$ | $\sqcap$ | $\barwedge$ | $\triangledown$ | $\dashv$ |
|---|---|---|---|---|
| $\sqcap$ | $\sqcap$ | $\barwedge$ | $\triangledown$ | $\dashv$ |
| $\barwedge$ | $\barwedge$ | $\triangledown$ | $\lrcorner$ | $\sqcap$ |
| $\triangledown$ | $\triangledown$ | $\lrcorner$ | $\sqcap$ | $\barwedge$ |
| $\dashv$ | $\dashv$ | $\sqcap$ | $\barwedge$ | $\triangledown$ |

**6)** Determine the sum or difference in clock-7 arithmetic:

**a.** $7+9$ **b.** $2-3$ **c.** $4-(3+12)$

## AXIOMS

A1) If $a,b \in \mathbb{Z}$, then $a+b \in \mathbb{Z}$ and $a \cdot b \in \mathbb{Z}$

A2) If $a,b \in \mathbb{R}$, then $a+b \in \mathbb{R}$ and $a \cdot b \in \mathbb{R}$

A3) $a+(b+c)=(a+b)+c$ for any $a,b,c \in \mathbb{R}$

A4) $a \cdot (b \cdot c)=(a \cdot b) \cdot c$ for any $a,b,c \in \mathbb{R}$

A5) $a+b=b+a$ for any $a,b \in \mathbb{R}$

A6) $a \cdot b=b \cdot a$ for any $a,b \in \mathbb{R}$