MTH 301
Exam 3
Spring 2013

100 points possible.

1. (10 pts.) The binary search algorithm and flowchart are on supplemental pages. Perform a binary search trace on 3, 6, 7, 10, 11, 12, 14, 15. Search for 12. Show your work in a trace table.

2. (20 pts.) Continually subtract, in turn, the less from the greater, and take note of the last nonzero remainder. Show your work.

(a) 307 and 617

(b) 624 and 390

3. (10 pts.) Find the least positive inverse for 25 modulo 67. Show your work.

4. (10 pts.) Find 21^{13} mod 23. Show your work.

5. (10 pts.) Compute the summation.

$$\sum_{m=0}^{3} \frac{1}{2^m}$$

6. (10 pts.) Write using summation notation.

$$\frac{3}{4 \cdot 5} - \frac{4}{5 \cdot 6} + \frac{5}{6 \cdot 7} - \frac{6}{7 \cdot 8} + \frac{7}{8 \cdot 9}$$

7. (15 pts.) Prove.

For all integers a, b, and c, if $a \nmid (9b - 10c)$, then $a \nmid 3b$ or $a \nmid 5c$.

8. (15 pts.) Prove using the Principle of Mathematical Induction.

$$\sum_{i=1}^{n}(7i-5) = \frac{n(7n-3)}{2} \qquad \text{for all integers } n \geq 1$$