

MAT310 Test 1, Spring 2006: Chapters 1-3

Name:

Directions: Show your work! Answers without justification will likely result in few points. Your written work also allows me the option of giving you partial credit in the event of an incorrect final answer (but good reasoning). Indicate clearly your answer to each problem (e.g., put a box around it). **Good luck!**

You may use Mathematica, and the Mathematica file found on our website:

<http://www.nku.edu/~longa/classes/mat310/days/day12.html>

but no other computer resources.

Problem 1 (10 pts) Prove that there are infinitely many primes.

Problem 3 (10 pts). Demonstrate that $\sqrt[3]{7}$ is irrational.

Problem 4 (10 pts).

1. Calculate $d \equiv \gcd(89, 55)$ using the **Euclidean algorithm**.

2. Express d as a linear combination of 89 and 55.

Extra Credit (2pts) What is remarkable about this example? Explain why this happens.

Problem 5 (10 pts). A farmer buys 100 animals for \$100. The animals include at least one cow, one pig, and one chicken. If a cow costs \$10, a pig costs \$3, and a chicken costs \$0.50, how many of each did he buy?

Problem 6 (10 pts).

1. Demonstrate that the square of any odd integer is of the form $8k + 1$.

2. Demonstrate that the square of any prime $p > 3$ is of the form $6k + 1$.

Problem 7 (10 pts). Find the 10th and 20th pairs of twin primes.