Math 290 Number Theory for Teachers
Homework 7
Due: Wednesday, March 19, 2014

1. Describe and justify a divisibility rule for 11. (Justification with an example is fine; just be sure to address why your explanation works more generally too.)

2. Describe and justify a divisibility rule for 4.

3. Describe and justify a divisibility rule for 7.

4. Determine whether 9743265 is divisible by 495. Explain and show all your work. (Note that $495 = 3^2 \cdot 5 \cdot 11$.)

5. Determine whether 1938216 is divisible by 168. Explain and show all your work.

6. Use the "universal divisibility test" repeatedly to determine if 459316 is divisible by 11. Explain why this is actually the same as the more familiar "alternating sum" divisibility test for 11.

7. Use the "universal divisibility test" to determine whether 258013 is divisible by 31.

8. Describe in your own words the method of casting out nines. Be sure to include an explain when you would use it and what it tells you. You may want to use examples in your description.

9. Explain the mathematical reasoning behind the method of casting out nines. Why does it do what you said in the previous problem?

10. Give two concrete examples of errors that the method of casting out nines would not catch. It is best if these errors are somewhat different in nature. (Note: this question is asking for examples of computations that have errors. However, casting out nines, done correctly, should not indicate that there is a mistake.)