

Instructions: Show all work. Use exact answers unless specifically asked to round. Be sure to complete all parts of each problem.

1. Use divisibility tests to determine if the number 584,495,245 is divisible by 2, 3, 4, 5, 8, 9.

2 - no 4 - no 8 - no
 3 - no 9 - no
 5 - yes

2. Find all the natural number factors of 198.

1, 198 9, 22 $\{ 1, 2, 3, 6, 9, 11, 18, 22, 33, 66, 99, 198 \}$
 2, 99 11, 18
 3, 66
 6, 33

3. Test $M_n = 2^n - 1$ to see if the number is prime, for a) $n = 10$, and b) $n = 13$. If the number is composite, list its prime factors.

$$M_{10} = 1023$$

$$3, 341$$

$$11, 93$$

$$31, 33$$

not prime

$$3, 11, 31$$

$$M_{13} = 8191$$

prime

4. Use the approximation of Binet's formula $F_N = \left[\left(\frac{1+\sqrt{5}}{2} \right)^N / \sqrt{5} \right]$ to find F_{13} and F_{14} .

$$F_{13} = 233$$

$$F_{14} = 377$$

5. What is the formula for $\bar{\phi}$?

$$\frac{1-\sqrt{5}}{2}$$