

Math 222 Practice Problems 2

Sections 3.1-3.3

1. Show that $n^6 - 17n^3 + 16n^2$ is $O(n^6)$.
2. Show that $\frac{5n^3+6}{n+13}$ is $O(n^2)$.

Sections 3.4-3.5

3. For each of the pairs of numbers below, find q and r so that $a = qd + r$ and $0 \leq r < d$.
 - a) $a = 137, d = 29$
 - b) $a = 10824, d = 36$
 - c) $a = -269, d = 17$
4. Simplify each of the quantities below. When working mod n , your final answer should be at least 0 and less than n .
 - a) $429075 \cdot 312018 \pmod{11}$
 - b) $-9012 \cdot 10400 + 879 \pmod{36}$
5. Find a number x between 0 and 807 that satisfies $x \equiv 67 \pmod{101}$ and $x \equiv 5 \pmod{8}$.

Section 3.6

6. Compute $10^{46} \pmod{17}$ using successive squaring. Show all your work.
7.
 - a) Use the Euclidean Algorithm to find $\gcd(24310, 10608)$.
 - b) Use part a) to find integers x and y so that $1326 = 24310x + 10608y$.

Section 4.1

8. Show that $1^2 + 2^2 + \dots + n^2 = \frac{n(n+1)(2n+1)}{6}$ for $n \geq 1$.
9. Show that $3n^2 + 9n$ is divisible by 6 for $n \geq 1$.

Sections 4.3-4.4

10. Give a recursive definition of each sequence below.

a) $a_n = 2n + 3$ for $n = 0, 1, 2, \dots$

b) $a_n = 7^n$ for $n = 1, 2, 3, \dots$

c) the sequence $a_1, a_2, a_3, a_4, \dots$ given by $2, 5, 2, 5, 2, 5, \dots$