Section 3.2

1. Determine whether each of these functions is O(x).

b) f (x) = 3x + 7

$|3x + 7| \leq |4x + 1| = 4|x|, \forall x > 7$

$C = 4, K = 7$

c) f (x) = $x^2 + x + 1$

$|x^2 + x + 1| \leq C|x|, \forall x$

Constant C does not exist.

Section 3.3

3. Give a big-O estimate for the number of operations, where an operation is a comparison or a multiplication, used in this segment of an algorithm (ignoring comparisons used to test the conditions in the for loops, where $a_1, a_2, ..., a_n$ are positive real numbers).

m := 0

for i := 1 to n

for j := i + 1 to n

m := max($a_i a_j$, m)

$n(n - 1) / 2 * 2 = n^2 - n$

$f(n) = n^2 - n$

$n^2 - n = n^2, \forall n > 1$

$C = 1, K = 1$

$O(n^2)$

19. How much time does an algorithm using 2^{50} operations

need if each operation takes these amounts of time?

a) 10^{-6} s

$2^{50} * 10^{-6} = 1125899906.84 * \frac{1\ min}{60\ sec} * \frac{1\ hr}{60\ min} * \frac{1\ day}{24\ hr} * \frac{1\ mon}{30\ day} * \frac{1\ yr}{12\ mon}$ = 36.20 years