HW 1 Solution

1. (a) $C_1 \cup C_2 = \{0, 1, 2, 3, 4\}$

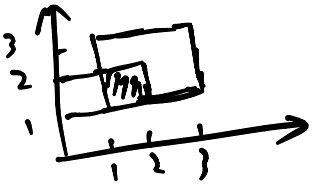
(3pt) $C_1 \cap C_2 = \{2\}$

(b) $C_1 \cup C_2 = \{x : 0 < x < 3\}$

(3pt) $C_1 \cap C_2 = \{x : 1 \le x < 2\}$

(c) $C_1 \cup C_2 = \{(x,y) : 0 < x < 1, 1 < y < 2\} \cup \{(x,y) : 1 < x < 3, 1 < y < 3\}$

(4pt) $C_1 \cap C_2 = \{(x,y) : 1 < x < 2, 1 < y < 2\}$.



2.

(a) $\lim_{k\to\infty} C_k = \{x : 0 < x < 3\}$. Note: neither the number 0 nor the number 3 is in any of the sets C_k, $k = 1, 2, 3, \ldots$

(5pt)

(b) $\lim_{k\to\infty} C_k = \{(x,y), 0 < x^2 + y^2 < 4\}$

(5pt)

3.

(2pt) $P(C_1) = \frac{13}{52} = \frac{1}{4}$

(2pt) $P(C_2) = \frac{4}{52} = \frac{1}{13}$

(3pt) $P(C_1 \cap C_2) = \frac{1}{52}$

(3pt) $P(C_1 \cup C_2) = \frac{16}{52} = \frac{4}{13}$

4.

(10pt)

The probability that he does not win a prize is

$$\binom{990}{5} \Big/ \binom{1000}{5}.$$

The prob. that he wins at least one prize is

$$1 - \binom{990}{5} \Big/ \binom{1000}{5} \approx 0.049$$