Problem 1. (10 points). Let $X = \{1, 2, 3, 4\}$ and $Y = \{3, 4, 5\}$. List all elements of the following sets:

$X \cup Y \;=$

$X \cap Y \;=$

$X - Y \;=$

$Y - X \;=$

$X \times Y \;=$

$\mathbf{P}(Y) \;=$

Note: $\mathbf{P}$ denotes the power set of Y.

Problem 2. (10 points). Consider a relation $R \subseteq \{a, b, c, d, e\}^2$ defined by the table below. (The symbols Y and N in an x, y indicate whether xRy or not.) (a) Is R an equivalence relation? (b) If so, give the equivalence classes of R.

R	a	b	c	d	e
a	Y	N	Y	Y	N
b	N	Y	N	N	Y
c	Y	N	Y	Y	N
d	Y	N	Y	Y	N
e	N	Y	N	N	Y

Problem 3. Let $a > 0$. Use induction to prove the formula for the sum of a geometric sequence:

$$\sum_{i=0}^{n} a^i = \frac{a^{n+1} - 1}{a - 1}$$