Name: Key

STAT 345 - Summer, 2006 - Quiz 4
BASED ON SECTIONS: 3.1 – 3.2

1. The probability mass function of a random variable X is given in the table below.

x_i	$f(x_i)$
-2	0.10
-1	0.20
0	0.30
1	0.25
2	0.15

Find the following: (1 point each)

(a) $P(X = 2)$

$P(X = 2) = 0.15$

(b) $P(X > -1)$

$P(X > -1) = P(X = 0) + P(X = 1) + P(X = 2) = 0.30 + 0.25 + 0.15 = 0.70$

(c) $P(-2 \leq X < 0)$

$P(-2 \leq X < 0) = P(X = -2) + P(X = -1) = 0.10 + 0.20 = 0.30$

(d) $P(X \leq -1 \text{ or } X = 2)$

$P(X \leq -1 \text{ or } X = 2) = P(X = -2) + P(X = -1) + P(X = 2) = 0.10 + 0.20 + 0.15 = 0.45$

(e) $P(X \leq 2)$

$P(X \leq 2) = 1$

2. In a semiconductor manufacturing process, three wafers from a lot are tested. Each wafer is classified as pass or fail. Assume that the probability that a wafer passes the test is 0.9 and that wafers are independent. Determine the probability mass function of the number of wafers from a lot that pass the test. (5 points)

   Let f denote a wafer that fails the test and p a wafer that passes. Then x has range $\{0, 1, 2, 3\}$ where $x = 0$ corresponds to $\{fff\}$, $x = 1$ corresponds to $\{\{ffp\}, \{fpf\}, \{pff\}\}$, $x = 2$ corresponds to $\{\{fpp\}, \{pfp\}, \{ppf\}\}$, and $x = 3$ to $\{ppp\}$. This gives the distribution:

x	$f(x)$
0	$(0.1)^3$
1	$3(0.9)(0.1)^2$
2	$3(0.9)^2(0.1)$
3	$(0.9)^3$