

**HW 4**

- (15pt) A coin is biased such that a head is three times as likely to occur as a tail. Find the expected number of tails when this coin is tossed twice.
- (15pt) The density function of the continuous random variable  $X$ , the total number of hours, in units of 100 hours, that a family runs a vacuum cleaner over a period of one year, is

$$f(x) = \begin{cases} x, & 0 < x < 1, \\ 2 - x, & 1 \leq x < 2, \\ 0, & \text{elsewhere.} \end{cases}$$

Find the average number of hours per year that families run their vacuum cleaners.

- (15pt) The hospitalization period, in days, for patients following treatment for a certain type of kidney disorder is a random variable  $Y = X + 4$ , where  $X$  has the density function

$$f(x) = \begin{cases} \frac{32}{(x+4)^3}, & x > 0, \\ 0, & \text{elsewhere.} \end{cases}$$

Find the average number of days that a person is hospitalized following treatment for this disorder.

- (15pt) The cost of a certain vehicle diagnostic test depends on the number of cylinders  $X$  in the vehicle's engine. The probability distribution of  $X$  is shown as the table below. Suppose the cost function is given by  $h(X) = 20 + 3X + 0.5X^2$ .

$x$	4	6	8
$p(x)$	0.5	0.3	0.2

Find the expected cost.

- (20pt) Evaluate  $E(2XY^2 - X^2Y)$  for the joint probability distribution shown as follows.

$f(x, y)$		$x$			Row
		0	1	2	Totals
$y$	0	$\frac{3}{28}$	$\frac{9}{28}$	$\frac{3}{28}$	$\frac{15}{28}$
	1	$\frac{3}{14}$	$\frac{3}{14}$	0	$\frac{3}{7}$
	2	$\frac{1}{28}$	0	0	$\frac{1}{28}$
Column Totals		$\frac{5}{14}$	$\frac{15}{28}$	$\frac{3}{28}$	1

- (20pt) If the joint density function of  $X$  and  $Y$  is given by

$$f(x, y) = \begin{cases} \frac{2}{7}(x + 2y), & 0 < x < 1, 1 < y < 2, \\ 0, & \text{elsewhere,} \end{cases}$$

find the expected value of  $g(X, Y) = \frac{x}{y^3} + X^2Y$ .