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MTH 1187–Probability   **EXAM 1**   **Winter 2001**

Instructions: This is an open-book exam. There are 5 problems, worth 40 points in all. Put your name in the blanks above. Put your final answers to each question in the designated spaces on these pages. Show your work—if there is not enough room, use another sheet.

(1) [8 points] A fair die is thrown and then one card is chosen at random from a deck of cards, containing no face cards (just aces, worth 1, to tens).

(a) Set up the sample space and the probability function which describe this experiment.

(b) Compute the probability that the card drawn has a numerical value at least twice that on the face of the die.

(2) [8 points] In a poll, 80 students from a small rural college were asked which color they prefer. Multiple preferences were allowed. Of the students polled, 30 preferred blue and 20 preferred green. In fact, 8 of those students preferred both blue and green. If a student from that college is picked at random, what is the probability that the student will prefer:

(a) Any color except blue or green?

(b) Only the color blue, but not green?

(c) Green, but not blue?

(3) [6 points] A random variable X has probability density function given by $f(x) = \dfrac{3}{x^4}$ for $x > 1$ and 0 for $x \le 1$ (the graph of f is shown below). The area under the curve to the <u>right</u> of c is $\dfrac{1}{c^3}$. Find the probability that X is between $\dfrac{3}{2}$ and $\dfrac{7}{2}$.
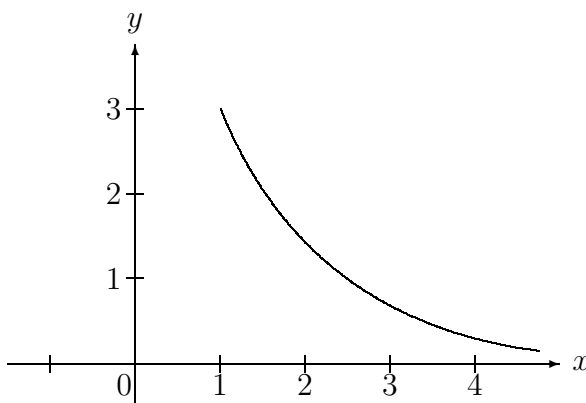
(4) [9 points] A delicatessen has up to 6 pounds of mushrooms delivered every day. A study has shown that the probability that the weight of the mushrooms sold in a day equals x pounds is given by the probability distribution function

$$f(x) = \begin{cases} c \cdot x & \text{for } 0 \le x \le 6 \\ 0 & \text{otherwise.} \end{cases}$$

(a) Find the constant c, and draw the graph of f.

(b) Find the cumulative distribution function $F(x)$, and draw its graph.

(c) Find the probability that at least 4 pounds of mushrooms are sold on a given day.

(5) [9 points] Two numbers, X and Y, are picked at random between 0 and 4. Find:

(a) $P(X + Y < 1)$

(b) $P(X + Y = 3)$

(c) $P(X + Y < 6)$

(d) $P(X + Y < 8)$