Question	Points	Score
1	3	
2	4	
3	4	
4	6	
Total	17	

Name: ______________________________

Date: ______________________________

Kontinua 26 (3/5)

The Physics of Gases

Duration: 25 minutes
Calculator allowed

Ideal Gas Law

$$PV = nRT$$

where:

P = pressure in pascals

V = volume in cubic meters

n = number of molecules in moles

R = the molar gas constant: 8.31446

T = temperature in Kelvin

Binomial Distribution

$$f(x; n, p) = b(x; np) = \binom{n}{x} p^x (1-p)^{n-x}$$

$$\mu = E(x) = np$$

$$\sigma_x^2 = np(1-p)$$

1. (3 points) In a particular game, a fair die is tossed. If the number of spots showing is either 4 or 5 you win \$1, if the number of spots showing is 6 you win \$4, and if the number of spots showing is 1, 2, or 3 you win nothing. Let X be the amount that you win. What is the expected value of X?

2. (4 points) The weight of written reports produced in a certain department has a Normal distribution with mean 60 g and standard deviation 12 g. The probability that the next report will weigh less than 45 g is

   (a) 0.1056
   (b) 0.3944
   (c) 0.1045
   (d) 0.8944

3. (4 points) Complete these equations: (2 points per equation)

(a) (2 points)

$$\frac{2}{5} + \frac{3}{7} =$$

(b) (2 points)

$$\frac{2}{5} + \frac{3}{7} =$$

4. A reservation service employs five information operators who receive requests for information independently of one another, each according to a Poisson process with rate $\mu = 2$ per minute.

   (a) (3 points) What is the probability that during a given 1-min period, the first operator receives no requests?

   (b) (3 points) What is the probability that during a given 1-min period, exactly four of the five operators receive no requests?(*Hint*: treat either as a binomial process of 5 trials with 4 successes or consider 5 combinations of Poisson processes, e.g. only 1st operation receives a request or only 2nd operation receives a request and so on)