Sample Exam 1 Answers - Math 464/564 - Spring 07 -Kennedy

1. (a) 0.3 (b) 1/3

2. (a) 0.295 (b) 0.852

3. Note: parts (a) and (b) were not meant to have anything to do with each other.
(a) use law of uncons. stat., get geometric series which sums to $1/(2e-1)$.
(b) Use properties of E. $E[3X-2] = 3E[X] - 2 = 3n/2 - 2$. $E[2X^2+1] = 2E[X^2]+1$. To find $E[X^2]$ use $var(X) = n/4$ and $var(X) = E[X^2] - (E[X])^2$. Answer: $E[2X^2+1] = n/2 + n^2/2 + 1$.

4. $E[Y] = 1/2$. Note: It is wrong to say that $Y = X/4$. Unfortunately this happens to give the correct answer. 564 students were also asked to find $var(Y)$. It works out to be $1/2$ as well. (This is not a coincidence. Y can be shown to be a Poissson RV.)

5. (a)
$$\frac{10!\ 6!\ 2!}{18!}$$
(b) Imagine first distributing the one's, then the five's, then the ten's:
$$\frac{12!}{10!\ 2!}\frac{8!}{6!\ 2!}\frac{4!}{2!\ 2!}$$

6. (a)
$$\frac{5 \cdot 4 \cdot 3}{n(n-1)(n-2)}$$
Note that this is also equal to
$$\frac{\binom{5}{3}}{\binom{n}{3}}$$
(b)
$$\frac{n-2}{n(n-1)(n-2)} = \frac{1}{n(n-1)}$$
(c) 1/6