1. Let X have the density function
\[ f_x(x) = \begin{cases} \frac{2x}{k^2} & \text{for } 0 \leq x \leq k, \\ 0 & \text{otherwise}. \end{cases} \]
For what value of k is the variance of X equal to 2?
(A) 2  (B) 6  (C) 9  (D) 18  (E) 36

2. Let \( X_1 \) and \( X_2 \) be independent random variables, each with density function
\[ f_x(x) = \begin{cases} 2 - 2x & \text{for } 0 < x < 1, \\ 0 & \text{otherwise}. \end{cases} \]
What is the probability that exactly 1 of the 2 variables exceeds \( \frac{1}{2} \)?
(A) \( \frac{1}{16} \)  (B) \( \frac{6}{16} \)  (C) \( \frac{7}{16} \)  (D) \( \frac{8}{16} \)  (E) \( \frac{9}{16} \)

3. The random variable X has density function
\[ f_x(x) = \begin{cases} c x^{k+1}(1-x)^k & \text{for } 0 < x < 1, \\ 0 & \text{otherwise}, \end{cases} \]
Where c > 0 and 1 < k < 2. What is the mode of X?
(A) \( \frac{k+1}{2k+1} \)  (B) k + l \( \frac{1}{k+1} \)  (C) \( \frac{k}{k+1} \)  (D) \( \frac{k+1}{2k} \)  (E) \( \frac{k+2}{2k+3} \)

4. Let X have the density function
\[ f_x(x) = \begin{cases} e^{x^2} & \text{for } x < 2, \\ 0 & \text{otherwise}. \end{cases} \]
What is the 75-th percentile of X?
(A) \( 2 + \ln \frac{3}{4} \)  (B) \( 2 - \ln \frac{3}{4} \)  (C) \( \ln(1 + \frac{3}{4} e^{x^2}) \)  (D) \( \ln(1 - \frac{3}{4} e^{x^2}) \)  (E) \( 2 + \ln \frac{1}{4} \)
5. For Company A there is a 60% chance that no claim is made during the coming year. If one or more claims are made, the total claim amount is normally distributed with mean 10000 and standard deviation 2000. For Company B there is a 70% chance that no claim is made during the coming year. If one or more claims are made, the total claim amount is normally distributed with mean 9000 and standard deviation 2000. Assume that the total claim amounts of the two companies are independent. What is the probability that, in the coming year Company B’s total claim amount will exceed Company A’s total claim amount?
(A) 0.180  (B) 0.185  (C) 0.217  (D) 0.223  (E) 0.240

6. The number of typos per chapter of an actuarial examination study manual follows a binomial distribution with n=5 and p=0.1. Given that there are m typos in a given chapter, the number of calculation errors in the same chapter is 0 with probability 0.60, m with probability 0.30, and m+1 with probability 0.10. Calculate the expected number of typos in a chapter given that there are 2 calculation errors in that chapter.

\[
(A) \frac{7}{5} (B) \frac{3}{5} (C) \frac{9}{5} (D) \frac{5}{7} (E) \frac{9}{7}
\]

7. A student in a probability class sends an e-mail to her professor teaching the class. One out of every thousand e-mails is destroyed by a computer virus planted in the computer system by a hacker. Assuming the professor is Polish, and thus required by the customs of Polish culture to answer every e-mail received, what is the probability that the student's e-mail did not reach the professor, given that the student does not receive a response? Assume that disappearances of messages are independent of each other.
(A) 0.4900  (B) 0.4975  (C) 0.5000  (D) 0.5003  (E) 0.6025

Answer: BBAAD AD