MTH 324, Quiz #3, Fall 2023 Name KEY

Instructions: Answer each question as thoroughly as possible. Round answers to 4 decimal places as needed. Exact answers are best when possible. Be sure to answer all parts of each question.

1. Identify the type of distribution used in the problems below. Identify any parameters, but you do not need to perform the calculations.
   a. A drive-thru at a particular bank sees 10 customers pass through during a particular hour of the day. Determine the probability that the check line will see 12 or more passengers in the next 10 minutes?

   Poisson

   b. The length of a particular sample of snakes has a mean of 69 inches and a standard deviation of 5 inches. What is the probability that a snake in the colony will have a length of more than 75 inches?

   normal

   c. A particular assembly line produces ball bearings between 1.4 and 1.5 cm in diameter 98% of the time and ball bearings outside that range 2% of time. A sample of 100 bearings is sent to quality control. What is the probability of having a sample with no ball bearings outside the required range?

   binomial

2. Consider the probability distribution given by $\int_0^1 K(x^2 - x^3)dx$.
   a. Find the value of K that makes this a valid probability distribution.

   $\int_0^1 K(x^2 - x^3)\,dx = K(\frac{1}{12}) = 1$

   $K = 12$

   b. Find the probability that $P(0.5 \leq X \leq 0.75)$.

   $0.42578125 = \frac{109}{256}$

   c. Find the mean of the distribution.

   $E(X) = \int_0^1 12x(x^2 - x^3)\,dx = 0.6 = \frac{3}{5}$