Name: ____________________

ID: ____________________

Quiz section or time: ____________________

10 + 12

Stat/Math 390, FALL, Test 1, Oct. 16, 2009; Marzban

Open everything, closed messaging/discussion

Check front page and back page.

Multiple-choice: mark best answer on these pages. DO NOT EXPLAIN.

The rest: SHOW your answer and your WORK, on these pages;

Points NO CREDIT FOR CORRECT ANSWER WITHOUT EXPLANATION.

1.13 or 1.71

2 **1.** The proportion of times that a variable x is below some number is called the *cumulative* mass (or density) function. If you are given such a cumulative mass function, is it possible to reconstruct the mass function itself?

a) Yes b) No

Eq. 1.22

2 **2.** Let X denote the number of heads out of 100 tosses of a fair coin. When we use the binomial distribution to compute the "proportion of $X = 2$", what is that proportion?

a) Number of heads divided by 100.

b) Probability of getting 2 heads.

c) Number of times one gets 2 heads out of 100 tosses divided by 100.

d) Number of times one gets 2 heads out of 100 tosses divided by the number of times 100 coins are tossed.

2.? Lecture 6

2 **3.** For a finite number of measurements on a single variable, the mean of the deviations

a) is the sample standard deviation b) is the population standard deviation

c) is always 0. d) depends on the data.

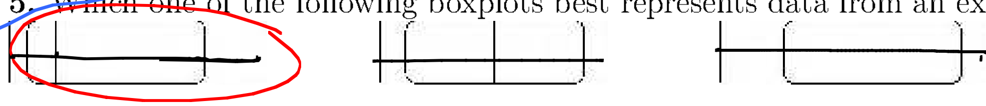
2.? hw-5

2 **4.** Suppose x is given in meters and its variance is given by s^2. If we convert all the x's to centimeters, and then compute the variance, it will be

a) s^2, b) $\sqrt{100}\ s^2$ c) $100\ s^2$ d) $100^2\ s^2$

1.? Lecture 6

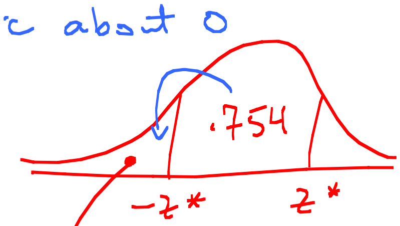
2 **5.** Which one of the following boxplots best represents data from an exponential distribution?



1.32

2 **6.** What value of z^* is such that the area under the standard normal curve between $-z^*$ and z^* is 0.754? Show work.

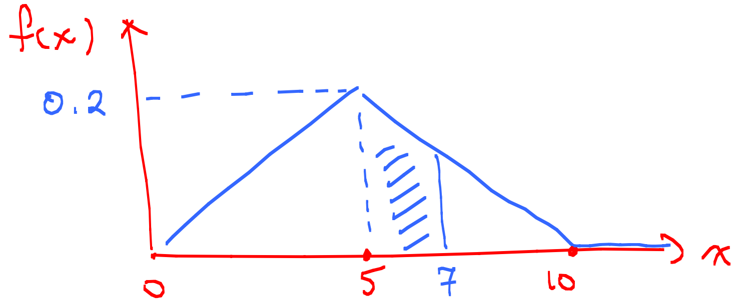
because Normal is symmetric about 0



$0.123 \Rightarrow$ (Table I) $\Rightarrow$ $\boxed{z^* = 1.16}$

1.22 **7.** Suppose the waiting time x (in minutes) at a bus stop, on any particular day, obeys the following density function.

$$f(x) = \begin{cases} 0.04x & 0 < x < 5 \\ 0.4 - 0.04x & 5 \le x < 10 \\ 0 & \text{else} \end{cases}$$



2 a) Draw the density function.

2 b) In the long run, what proportion of your waiting times will be between 5 & 7 mints? Show work.

$$\int_5^7 f(x)\,dx = \int_5^7 (0.4 - .04x)\,dx = 0.4\,x\Big|_5^7 - .04\,\tfrac{1}{2}x^2\Big|_5^7$$

$$= 0.4(2) - 0.04\,\tfrac{1}{2}(49-25) = \boxed{0.32}$$

Alternatively, subtract area of 2 triangles: $\frac{1}{2}(0.2)(10-5) - \frac{1}{2}(0.4-0.04(7))(10-7)$

2 → 3 2.23c **8.** Suppose the number of drivers traveling between two cities during a designated time period has a Poisson distribution with $\lambda = 20$. In the long run, during what proportion of such periods will the number of drivers be within one standard deviation of the mean value? Show work.

For Poisson : mean $= \lambda$, std. dev $= \sqrt{\lambda}$

$\text{prop}(\lambda - \sqrt{\lambda} < x < \lambda + \sqrt{\lambda}) = \text{prop}(15.5 < x < 24.5)$ because x = integer (discrete)

$= \text{prop}(16 \le x \le 24)$

$= \text{prop}(x=16) + \cdots + \text{prop}(x=24) = \boxed{0.687}$

2.60 & hw-I

2 **9.** In a homework problem you showed that the expected value (or mean) of the exponential distribution with parameter λ is $1/\lambda$. Use the fact that $\int_0^\infty (x-1)^2 e^{-x}\,dx = 1$ to compute the standard deviation of the exponential distribution. Show work.

Variance of exponential $= \int_{-\infty}^{\infty} (x - E[x])^2 f(x)\,dx = \int_0^\infty \left(x - \frac{1}{\lambda}\right)^2 \lambda e^{-\lambda x}\,dx$

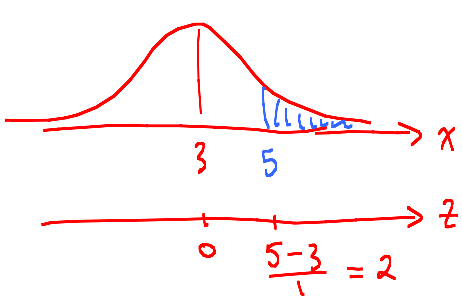
$$= \frac{1}{\lambda^2}\int_0^\infty (\lambda x - 1)^2 \lambda e^{-\lambda x}\,dx = \frac{1}{\lambda^2}\underbrace{\int_0^\infty (y-1)^2 e^{-y}\,dy}_{=1}$$ where $y = \lambda x$, $dy = \lambda\,dx$

$$= \frac{1}{\lambda^2} \implies \boxed{\text{std. dev} = 1/\lambda}$$

2.68 & Test 1 - Sample

2 **10.** Let x denote the maximum physical stress that a unit of a certain product encounters during its lifetime. Suppose that x is normally distributed with the 99th percentile $= 5.33$ and the 10th percentile is 1.72. What proportion of these units have maximum stress values exceeding 5? Show work.

From No. 8 on Test 1 - Sample : $\mu = 3$, $\sigma = 1$



$\text{prop}(z > 2) = 1 - \text{prop}(z < 2)$

$= 1 - 0.9772$

$= \boxed{0.0228}$