Stat 2470, 2/5 Discussion Questions Name _____

Instructions: Attempt to answer these questions by reading the textbook or with online resources before coming to class on the date above.

1. How do we find the expected value of a continuous distribution? How does this formula compare with the discrete formula for expected values?

$$\mu_X = E(X) = \int_{-\infty}^{\infty} x \cdot f(x)\,dx$$

2. State two versions of the formula for the variance? Express both versions in terms of integrals.

$$\sigma_X^2 = V(X) = \int_{-\infty}^{\infty} (x-\mu)^2 f(x)\,dx = E[(X-\mu)^2] = E(X^2) - [E(X)]^2$$
$$= \int_{-\infty}^{\infty} x^2 f(x)\,dx - \left[\int_{-\infty}^{\infty} x f(x)\,dx\right]^2$$

3. What is the formula for the normal distribution? What parameters are involved?

$$f(x;\mu,\sigma) = \frac{1}{\sqrt{2\pi}\,\sigma} e^{-(x-\mu)^2/2\sigma^2}$$

μ = mean
σ = standard deviation

4. What are the values of the parameters in the standard normal distribution? How does this simplify the function?

$\mu = 0,\ \sigma = 1$ $\qquad f(z;0,1) = \frac{1}{\sqrt{2\pi}} e^{-z^2/2}$

5. What special notation(s) is (are) used to represent the standard normal function and its cumulative distribution?

z used for variable instead of x

$\Phi(z)$ instead of $F(z)$

6. How can we use the calculator to find percentiles of the standard normal curve? What about non-standard normals?

normalcdf(-E99, x, μ, σ) if non-standard

normalcdf(-E99, x) = $\Phi(z)$

in TI-84 under DISTR

7. How can we use the calculator to find probabilities with the standard or general normal distributions?

$F(a \le x \le b)$ for x normal is

normalcdf(a, b, μ, σ) can leave μ, σ off if standard normal

8. What is a z critical value? What is the notation for it?

z_α where α is the probability above (or below) that z value & above is positive, below is negative

9. The book gives a list of common z critical values. Verify these values with your calculator. α = area in tail

use invNorm(α) to find values

10. How can we convert the random variable X with a general normal distribution to a standard score Z with a standard normal distribution? Give the formula.

$$Z = \frac{X - \mu}{\sigma}$$

11. Why might we want to perform this conversion?

if we are use a table of standard normal values instead of a calculator, or to compare values from different normal distributions

12. What is the Empirical Rule?

also 68-95-99.7

about 68% of area between (-1 and) 1 standard deviations of the mean, about 95% between (-2 and) 2 st-dev's and 99.7% within 3 st dev's

13. When doing a normal approximation to a discrete distribution, why do we have to add or subtract 0.5 from the discrete value?

think about forming a bin around the value 3 of 3 as the midpoint. what are all the values that round (normally) to 3? $[2.5, 3.5)$. called a continuity correction.

14. Under what conditions can we approximate binomials with a normal distribution? What do we use for μ and σ?

when both $np \ge 10$ and $nq \ge 10$

let $\mu = np$ and $\sigma = \sqrt{npq}$

15. Poisson distributions can also be approximated with normal distributions. What are μ and σ in this case? Does it require the continuity correction we used for the binomial? What conditions are necessary to make this approximation for the Poisson distribution?

$\mu = \mu$, $\sigma = \sqrt{\mu}$

it does require the continuity correction since the Poisson is discrete

let $\mu \geq 10$ is safe.