Name:_____ Math 130
Date: 3/17/2025 Exam 2

Please show ALL your work on the problems below. No more than 1 point will be given to problems if you only provide the correct answer and insufficient work.

1. (20 points) Suppose you are going to make a bet with your friend on the result of drawing a single card from a standard poker deck. Specifically, you will win $50 if you draw a red face card, you will lose $10 if you draw any other red card, and you will lose $5 is you draw any other card. Let X denote the amount of money you will win when playing this game once.

a) Find the probability distribution of X

b) Find the expected value of X

c) Find the standard deviation of X

d) Explain the meaning of your answer from part (b)

2. (3, 3, 6, 9, 6 points) Stella the cook is good at burning the meals she prepares. In fact, the probability that she burns a meal is 28%. Assume that Stella burning a given meal is independent of the other times she burns a meal. Let X denote the number meals Stella burns among the next 21 meals she prepares.

a) What distribution does X have?

b) Find the other 6 things you are supposed to list when solving problems for this kind of random variable.

c) What is the probability that Stella burns exactly 7 meals?

d) What is the probability that Stella burns between 7 and 9 meals (inclusive)?

e) What is the expected value, standard deviation, and variance of X?

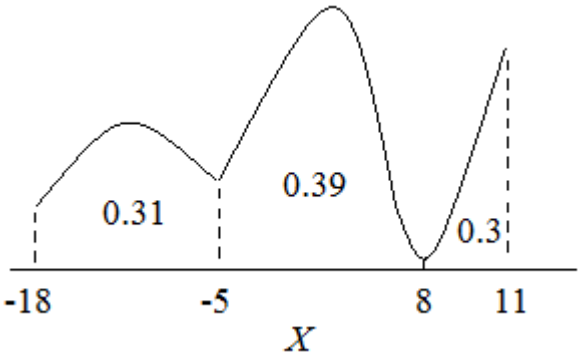
3. (7, 5, 7 points) Suppose the random variable X has a uniform distribution on the interval [9, 22].

a) Find the value of c that makes this a probability distribution

b) Find $P(X = 18)$

c) Find $P(2 < X < 18)$

4. (14 points) Suppose X is a random variable whose density curve is given below.



a) What are the possible values of X?

b) Find $P(-5 < X < 21)$

5. (28 points) The time it takes me to grade a stack of stats quizzes has a normal distribution with a mean of 30 minutes and a standard deviation of 6 minutes.

a) What is the probability that the next time I grade a stack of stats quizzes it will take me at most 20 minutes?

b) What is the probability that the next time I grade a stack of stats quizzes it will take me more than 45 minutes?

c) What is the probability that the next time I grade a stack of stats quizzes it will take me between 25 minutes and 32 minutes?

d) What does the probability you found in part (b) mean?

6. (5, 7 points) Consider the experiment where in order to complete the experiment once you have to first flip a single coin then roll a single die.

a) What is the sample space?

b) Define a random variable on this experiment.

Some formulas you may need:

$$P(A \cup B) = P(A) + P(B) - P(A \cap B) \qquad P(A \cup B) = P(A) + P(B)$$

$$P(A \cap B) = P(A) \cdot P(B \mid A) \qquad P(A \cap B) = P(A) \cdot P(B)$$

$$P(\overline{A}) = 1 - P(A) \qquad P(at \quad least \quad one) = 1 - P(none)$$

$$EV = \mu = \sum xp(X = x)$$

$$Var = \left[\sum x^2 p(X = x)\right] - \mu^2$$

$$\sigma = \sqrt{\left[\sum x^2 p(X = x)\right] - \mu^2}$$

$$P(X = x) = {}_nC_x p^x q^{n-x} \qquad \mu = np \qquad \sigma^2 = npq \qquad \sigma = \sqrt{npq}$$

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