Math 461 Quiz Solutions

Directions: Please write your name at the top of this page. There is a second page on the back.

1. What is the defining formula for conditional probability?

\[ P(E|F) = \frac{P(E \cap F)}{P(F)} \]

2.

3. Suppose that you are playing blackjack against a dealer with a standard 52-card deck (4 suits: Hearts, Diamonds, Spades, and Clubs; and 13 denominations: ace, 2, 3, ..., 10, J, Q, K). What is the probability that you have a blackjack or the dealer has a blackjack (a blackjack is one ace and one card worth ten: 10, J, Q, K)? It is acceptable to leave your answer unsimplified, but an approximation is a good idea.

Let \( A \) be the event that you are dealt a blackjack, and let \( B \) be the event that the dealer is dealt a blackjack.

Then the probability that you or the dealer have a blackjack is \( P(A \cup B) \), computed using the Inclusion-Exclusion Identity as follows:

\[
\begin{align*}
P(A) &= P(B) = \frac{2 \cdot 4 \cdot 16}{52 \cdot 51} \\
P(A \cap B) &= \frac{4 \cdot 4 \cdot 16 \cdot 3 \cdot 15}{52 \cdot 51 \cdot 50 \cdot 49} \\
P(A \cup B) &= P(A) + P(B) - P(A \cap B) = 0.0948.
\end{align*}
\]