

COT 3100H Quiz #2: Roots of Poly, Counting, Probability (2/27/2023)

Last Name: _____ **First Name:** _____

1) (5 pts) Let r and s be roots of the equation $x^2 - 3x + 5 = 0$. Find the quadratic equation with leading coefficient 5 which has the roots $\frac{r^2}{s}$ and $\frac{s^2}{r}$.

2) (5 pts) Jasmine writes down the positive integers in order starting at 1. What is the 10,005th digit she writes down? (Note: the 10th digit she writes down is 1 and the 11th digit she writes down is 0.)

3) (5 pts) An ant starts at $x = 0$ on the number line. At each second, the ant either moves one unit to the right (adding 1 to its x coordinate) or one unit to the left (subtracting one from its x coordinate). 12 seconds after the ant starts moving, he ends up at $x = -2$. How many different paths could the ant have taken? (Two paths are different if there is any second at which the ant made a different movement.) Please simplify the integer to a single integer.

4) (5 pts) If A and B are events and $p(A) = \frac{3}{7}$, $p(A \cap B) = \frac{1}{5}$, and $p(A|B) = \frac{2}{3}$, calculate $p(B)$, $p(B|A)$ and $p(B|\bar{A})$.

$p(B) = \underline{\hspace{2cm}}$, $p(B|A) = \underline{\hspace{2cm}}$, $p(B|\bar{A}) = \underline{\hspace{2cm}}$

5) (5 pts) How many permutations of 5 As, 5 Bs and 1 C don't have any substring of 2 repeated letters? (Thus, AA and BB can not appear anywhere in the permutation. One such permutation is ABABC BABABA.) Simplify your answer to a single integer.
