Program in Applied Mathematics
## PROBABILITY AND STATISTICS PRELIMINARY EXAMINATION
August 2008

<u>Notice</u>: **Do four of the following five problems. Place an X on the line opposite the number of the problem that you are NOT submitting for grading. Please do not write your name anywhere on this exam.**

1. _____
2. _____
3. _____

(b) **Find the best (most powerful) test of size** α **of** $\mu = 0$ **versus** $\mu = \mu_1$, **based on observing** W_1, W_2, W_3, **and** W_4.

(c) **Is there a uniformly most powerful test of** $\mu = 0$ **versus** $\mu > 0$ **based on** W_1, W_2, **and** W_3? **Explain.**

4. A subset of 4 dots is selected from a 4 by 3 rectangular array of dots depicted below.

row 1 –> ●   ●   ●

        ●   ●   ●

        ●   ●   ●

        ●   ●   ●
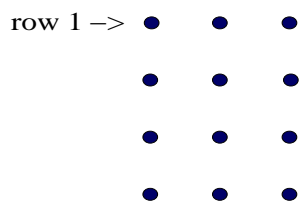
(a) What is the probability that no dot from the first row is selected?

(b) Find the expected number of rows with no selected dots.

(c) Find the variance of the number of rows with no selected dots.

5. Let N(t) be a Poisson counting process with rate λ. Let G(t) be a Gamma process, with parameters α and β, which is defined as follows. G(t) has stationary independent increments, with G(0) = 0 and $G(s + t) - G(s) \sim \ (\alpha t, \beta)$, where $X \sim \ (\alpha Tf \ Td \ , dTd \ Tfiean$