**3.2 Urinalysis**

Below are some real data on urine white blood cells from urinalyses as a test for urinary tract infection (UTI) of febrile infants < 3 months old.[1, 2] The top number in each cell is the number of infants; the number just below is the column percent. So, for example, 25.21% of the infants with a UTI had 0-2 White Blood Cells per High-Power Field (WBC/HPF).

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MICROSCOPIC|        UTI?
URINE WBCS |    YES |     NO    |  Total
-----------+--------+----------+--------
   0-2/HPF |     30 |      857 |      887
           |  25.21 |    83.53 |    77.47
-----------+--------+----------+--------
   3-5/HPF |     11 |       94 |      105
           |   9.24 |     9.16 |     9.17
-----------+--------+----------+--------
  6-10/HPF |     12 |       43 |       55
           |  10.08 |     4.19 |     4.80
-----------+--------+----------+--------
 11-20/HPF |     33 |       19 |       52
           |  27.73 |     1.85 |     4.54
-----------+--------+----------+--------
   >20/HPF |     33 |       13 |       46
           |  27.73 |     1.27 |     4.02
-----------+--------+----------+--------
     Total |    119 |     1026 |     1145
           | 100.00 |   100.00 |   100.00
```

a. Label the axes and draw an ROC curve for this test below.
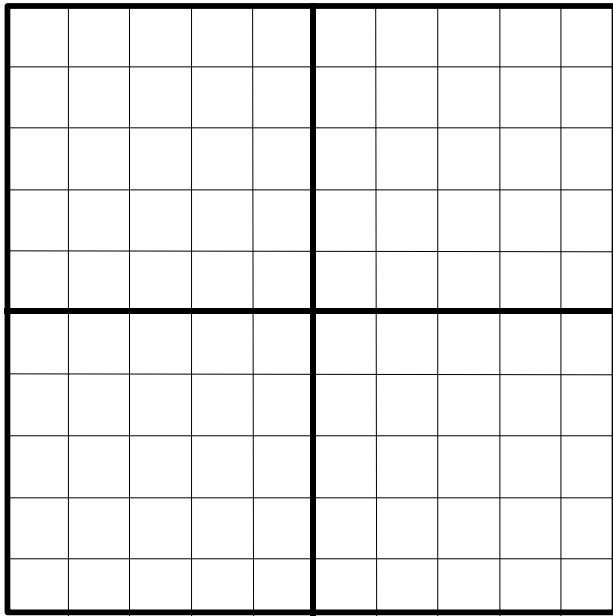
b) What is the area under it? (You can just estimate it by counting boxes.)

c). What are likelihood ratios for each category of urine WBC?

d) You are seeing a febrile 6-week old who you can assume as the same prior probability of UTI as the infants in this study. If the urine has 11-20 WBC/HPF, what is your best estimate of the posterior probability?

e)   In this study the prior probability of UTI in a girl was about 12%. What would the posterior probability be if she had 6-10 WBC/HPF on her urinalysis?

f) Let's suppose you would begin empiric treatment for UTI if the probability were 15% or more. At what prior probability of UTI would you treat regardless of the UWBC result?

References

1.   Schroeder AR, Newman TB, Wasserman RC, Finch SA, Pantell RH. Choice of urine collection methods for the diagnosis of urinary tract infection in young, febrile infants. Arch Pediatr Adolesc Med. 2005;159(10):915-22.
2.   Newman TB, Bernzweig JA, Takayama JI, Finch SA, Wasserman RC, Pantell RH. Urine testing and urinary tract infections in febrile infants seen in office settings: the Pediatric Research in Office Settings' Febrile Infant Study. Arch Pediatr Adolesc Med. 2002;156(1):44-54.