Department of Electrical & Computer Engineering
Prairie View A&M University

Ph.D. Preliminary Examination
in
Mathematics
Spring 2013

Write legibly.
No points will be given for answers that show no work.

Do not use cell phone and calculator during the examination.
(Calculator will be provided upon request)

Note: Each problem is worth 20 points.

Name: _____ **Date: March 22, 2013**

1. Evaluate $\iint_R e^{-(x^2+y^2)}\,dxdy$

where R is the region in the xy-plane bounded by the circle $x^2 + y^2 = a^2$.

2. The region bounded by the graphs of the equations $x^2 = y - 2$, $2y - x - 2 = 0$, $x = 0$, and $x = 1$ is revolved about the x-axis. Find the volume of the resulting solid.

3. Jack and Judy both have classes that end at noon and they agree to meet every day after class. They arrive at the coffee shop independently. Jack's arrival time is X and Judy's arrival time is Y, where X and Y are measured in minutes after noon. The individual density functions are

$f_1(x) = e^{-x}$ if $x \geq 0$ $\qquad$ $f_2(y) = y/50$ if $0 \leq y \leq 10$

$= 0$ otherwise $\qquad$ $= 0$ otherwise

(Jack arrives sometime after noon and is more likely to arrive promptly than late. July always arrives by 12:10 PM and is more likely to arrive late than promptly.) After July arrives, she'll wait for up to half an hour for Jack, but he won't wait for her. Find the probability that they meet.

4. A rectangular box, open at the top, is to have a volume of 32 cubic feet. What must be the dimensions so that the total surface is a minimum?

5. *Evaluate* $\oint_C (4+e^{\sqrt{x}})dx + (\sin y + 3x^2)dy$, where C is the boundary of the region R between quarter circles of radii a and b, and the indicated segments on the x-and y-axes.