SM 223$_{\text{TSM}}$ Quiz #20 29 Nov 2010 Last Name SOLUTIONS Section ○4041 ○5041 ○6041

Time Limit: 4 minutes

Instructions: Calculator allowed. Closed book. Closed notes.

Instructions for all quizzes: **Do not discuss any aspect of this quiz with other midshipmen until after 6th period.**

Print your last name above. Also, fill in the bubble for your section.

Fill the bubble for the correct answer. Also, write your answers in any blanks provided.

Your work will not be graded unless the instructions request you show your work.

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1. In Cartesian coordinates we have $dA = dx\,dy$.
   In polar coordinates $dA =$ $r\,dr\,d\theta$

2. In polar coordinates, the point $(x, y) = (1, 1)$ is $(r, \theta) =$ $(\sqrt{2},\, \pi/4)$

   Reason. We have $r^2 = x^2 + y^2 = 1^2 + 1^2 = 2$. So $r = 1$. Also, it is clear that a segment from the origin to $(1, 1)$ makes a $45°$ degree angle with the positive x-axis. So $\theta = \pi/4$.

3. Rewrite the double integral in polar coordinates, where D is the region between the circles of radii 1 and 2 centered at the origin.

$$\int\int_D 3xe^{x^2+y^2}\,dA \quad = \quad \int_{\underline{0}}^{\underline{2\pi}} \int_{\underline{1}}^{\underline{2}} \underline{\qquad 3r\cos(\theta)\cdot e^{r^2}\cdot r \qquad}\, d\underline{r}\, d\underline{\theta}$$

   Reason. The region D is described by $0 \le \theta \le 2\pi$ and $1 \le r \le 2$.
   Also, $x^2 + y^2 = r^2$ and $x = r\cos(\theta)$.
   Finally, we must write $dA = r\,dr\,d\theta$.