Classroom Voting Questions: Multivariable Calculus

16.4 Double Integrals in Polar Coordinates

1. A point is at coordinates $(r, \theta) = (1, \pi)$. What are the rectangular coordinates of this point?

   (a) $(x, y) = (1, 0)$
   (b) $(x, y) = (0, 1)$
   (c) $(x, y) = (-1, 0)$
   (d) $(x, y) = (0, -1)$
   (e) More than one of the above

2. A point is at coordinates $(x, y) = (0, -1)$. What are the polar coordinates of this point?

   (a) $(r, \theta) = (1, \frac{3\pi}{4})$
   (b) $(r, \theta) = (1, \frac{3\pi}{2})$
   (c) $(r, \theta) = (1, -\pi)$
   (d) $(r, \theta) = (1, -\frac{\pi}{2})$
   (e) More than one of the above

3. Which of the following regions resembles a quarter of a doughnut?

   (a) $0 \leq r \leq 5$, $0 \leq \theta \leq \pi/2$
   (b) $3 \leq r \leq 5$, $0 \leq \theta \leq 2\pi$
   (c) $3 \leq r \leq 5$, $\pi \leq \theta \leq 2\pi$
   (d) $3 \leq r \leq 5$, $\pi \leq \theta \leq 3\pi/2$

4. Which of the following integrals is equivalent to $\int_0^3 \int_\pi^{2\pi} r d\theta dr$?

   (a) $\int_0^3 \int_{-\sqrt{9-x^2}}^0 1 dy dx$
   (b) $\int_{-3}^3 \int_0^{\sqrt{9-x^2}} 1 dy dx$

(c) $\int_{-3}^{3}\int_{0}^{\sqrt{9-y^2}} 1dxdy$

(d) $\int_{-3}^{0}\int_{-\sqrt{9-y^2}}^{\sqrt{9-y^2}} 1dxdy$

5. What geometric shape is describe by the equation $r = \theta$?

   (a) line
   (b) circle
   (c) spiral
   (d) none of the above

6. What geometric shape is describe by the equation $r = 4$?

   (a) line
   (b) circle
   (c) spiral
   (d) none of the above

7. What geometric shape is describe by the equation $\theta = 4$?

   (a) line
   (b) circle
   (c) spiral
   (d) none of the above

8. What geometric shape is describe by the equation $r = \sin\theta$?

   (a) line
   (b) circle
   (c) spiral
   (d) none of the above

9. What geometric shape is describe by the equation $r = 1/\sin\theta$?

   (a) line
   (b) circle

(c) spiral

(d) none of the above

10. Which of the following describes the upper half of the xy-plane?

(a) $0 \leq r \leq 2$, $0 \leq \theta \leq 2\pi$

(b) $0 \leq r \leq \infty$, $0 \leq \theta \leq \pi$

(c) $0 \leq r \leq \theta$, $0 \leq \theta \leq \pi$

(d) $2 \leq r \leq 4$, $\pi \leq \theta \leq 3\pi/2$

11. Which integral gives the area of the unit circle?

(a) $\int_{-1}^{1} \int_{-\sqrt{1-x^2}}^{\sqrt{1-x^2}} x dy dx$

(b) $\int_{0}^{2\pi} \int_{0}^{1} r dr d\theta$

(c) $\int_{0}^{2\pi} \int_{0}^{1} dr d\theta$

(d) $\int_{0}^{1} \int_{0}^{2\pi} d\theta dr$