

Name _____ ID _____ Section _____

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MATH 253

Exam 2

Fall 2003

Sections 504-506

P. Yasskin

Multiple Choice: (5 points each)

Work Out: (15 points each)

1. Compute $\int_1^2 \int_0^3 e^{x+y} dx dy$.

- a. $e^5 - e^4$
- b. $e^5 - e^2 - e^4 + e$
- c. $e^5 - e^2 - e^4 - e$
- d. $e^5 + e^2 - e^4 - e$
- e. $e^5 + e^4$

2. Compute $\int_1^2 \int_{-x}^x y dy dx$.

- a. 0
- b. $\frac{7}{6}$
- c. $\frac{4}{3}$
- d. $\frac{7}{3}$
- e. $\frac{8}{3}$

3. Rewrite the polar equation $r^2 = \sin 2\theta$ in rectangular coordinates.

a. $x^4 + y^4 = 2xy$

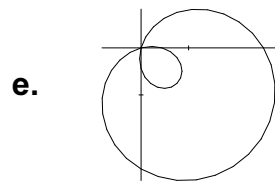
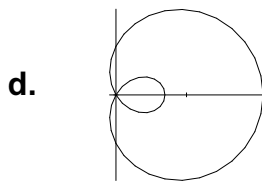
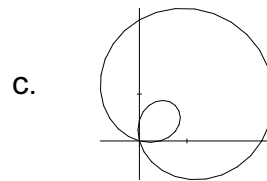
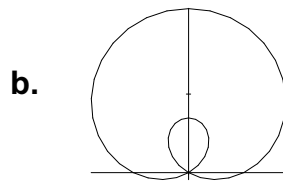
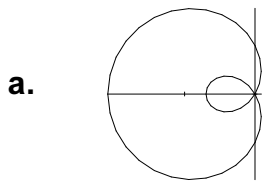
b. $(x^2 + y^2)^2 = 2xy$

c. $(x^2 + y^2)^{3/2} = 2y$

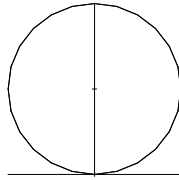
d. $(x^2 + y^2)^{3/2} = 2x$

e. $x^3 + y^3 = 2y$

4. Which of the following is the graph of the polar equation $r = \frac{1}{2} + \cos \theta$?



5. The graph of $r = 4 \sin \theta$ is



. Find the area enclosed.

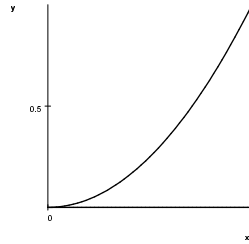
HINT: What is the interval for θ ?

- a. π
- b. 2π
- c. 4π
- d. 8π
- e. 16π

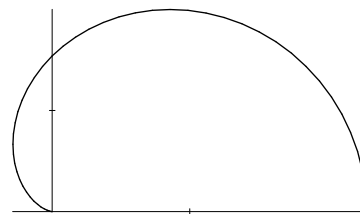
6. Compute $\int_0^2 \int_0^{\sqrt{4-x^2}} (x^2 + y^2)^3 dy dx$.

- a. π
- b. 2π
- c. 4π
- d. 8π
- e. 16π

7. Compute $\iint_D x \cos y dA$ over the region D bounded by $y = 0$, $y = x^2$ and $x = 1$.



- a. $\frac{-\cos 1}{2}$
- b. $\sin 1$
- c. $\frac{\sin 1}{2}$
- d. $\frac{1}{2}(1 - \sin 1)$
- e. $\frac{1}{2}(1 - \cos 1)$
8. A styrofoam board is cut in the shape of the upper half of the cardioid $r = 1 + \cos \theta$. A static electricity charge is put on the board whose surface charge density is given by $\rho_e = y$. Find the total charge on the board $Q = \iint \rho_e dA$.



- a. 0
- b. $\frac{2}{3}$
- c. $\frac{4}{3}$
- d. $\frac{8\pi}{3}$
- e. $\frac{16\pi}{3}$

9. Find all critical points of the function $f(x,y) = 2x^3 + 3x^2y + y^3 - 12y$ and classify each as a local maximum, a local minimum or a saddle point. (Make a table.)
10. Consider a box (like a donut box) whose lid folds closed so that when closed there are two layers of cardboard in the front and on each of the two sides while there is only one layer of cardboard on the top, bottom and back. If the box holds 3 m^3 , what are the dimensions which use the least amount of cardboard? Let L be the length side to side. Let W be the width front to back and let H be the height.

11. Find the mass and center of mass of the region between the parabola $y = x^2$ and the line $y = 4$, if the surface density is given by $\rho = y$.

12. Sketch the region of integration and then compute the integral $\int_0^1 \int_{y^2}^1 y^3 \sin(x^3) dx dy$.