MA 26100
EXAM 2 Green
November 7, 2017

NAME leaderboard YOUR TA'S NAME some one

STUDENT ID # 1 0 g 2 RECITATION TIME 101

1. You must use a #2 pencil on the mark–sense sheet (answer sheet).

2. Be sure the paper you are looking at right now is GREEN!

3. Write the following in the TEST/QUIZ NUMBER boxes (and blacken in the appropriate spaces below the boxes):

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4. On the mark-sense sheet, fill in your TA's name and the course number.

5. Fill in your NAME and STUDENT IDENTIFICATION NUMBER and blacken in the appropriate spaces.

6. Fill in your four-digit SECTION NUMBER. If you do not know your section number, please ask your TA.

7. Sign the mark–sense sheet.

8. Fill in your name, etc. on this paper (above).

9. There are 10 questions, each worth 10 points.Blacken in your choice of the correct answer in the spaces provided for questions 1–10. Do all your work on the question sheets.

10. Turn in both the mark–sense sheets and the question sheets when you are finished.

11. If you finish the exam before 7:20, you may leave the room after turning in the scantron sheet and the exam booklet. You may not leave the room before 6:50.
If you don't finish before 7:20, you MUST REMAIN SEATED until your TA comes and collects your scantron sheet and your exam booklet.

12. NO CALCULATORS, PHONES, BOOKS, OR PAPERS ARE ALLOWED. Use the back of the test pages for scrap paper.

EXAM POLICIES

1. Students may not open the exam until instructed to do so.
2. Students must obey the orders and requests by all proctors, TAs, and lecturers.
3. No student may leave in the first 20 min or in the last 10 min of the exam.
4. Books, notes, calculators, or any electronic devices are not allowed on the exam, and they should not even be in sight in the exam room. Students may not look at anybody else's test, and may not communicate with anybody else except, if they have a question, with their TA or lecturer.
5. After time is called, the students have to put down all writing instruments and remain in their seats, while the TAs will collect the scantrons and the exams.
6. Any violation of these rules and any act of academic dishonesty may result in severe penalties. Additionally, all violators will be reported to the Office of the Dean of Students.

I have read and understand the exam rules stated above:

STUDENT NAME: Leaderboard

STUDENT SIGNATURE: X

f $\quad 2+1+\frac{8}{9}$

1. Find the maximum value of $f(x, y, z) = 2x+y+4z$ subject to the constraint $x^2+y+z^2 = 6$. (You may assume that this function has an absolute maximum and no absolute minimum.)

A. 6
B. 7
C. 11
D. $4\sqrt{6}$
E. $6\sqrt{6}$

$\frac{\delta f}{\delta x} = 2 + 2x\lambda \qquad x = 1$

$2 = -2x$

$\frac{\delta f}{\delta y} = 1 - \lambda \rightarrow y = -\lambda$

$\frac{\delta f}{\delta z} = 4 + 2z\lambda \rightarrow \lambda = -\frac{z}{2}$

$2 = -2\lambda$

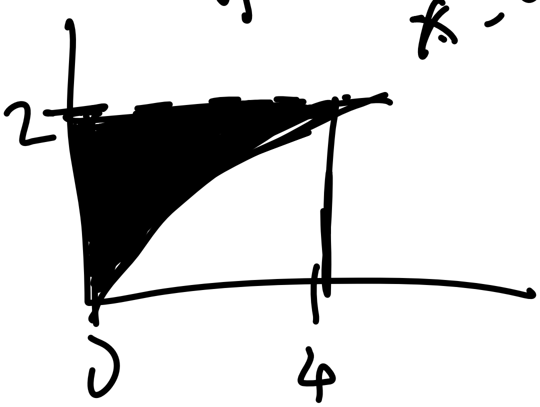
2. Compute the following double integral by changing the order of integration.

$$\int_0^4 \int_{\sqrt{x}}^2 y\cos(y^4)\; dy\, dx$$

A. $\frac{\sin 16}{4}$
B. $\frac{8\sin 16}{3}$
C. $2\sin 16$
D. $\frac{3\sin 16}{4}$
E. $\frac{\sin 16}{8}$

$y = \sqrt{x}$

$x = y^2$



$$\int_0^2 \int_0^{y^2} y\cos(y^4)\; dx\, dy$$

$$= \int_0^2 \left(y^3 \cos y^4\right) dy = \left(\frac{1}{4}\sin y^4\right)_0^2 = \frac{\sin 16}{4}$$

3. D is the region between the circles $x^2 + y^2 = 1$ and $x^2 + y^2 = 2$. Find $\displaystyle\iint_D e^{x^2+y^2}\, dA$.

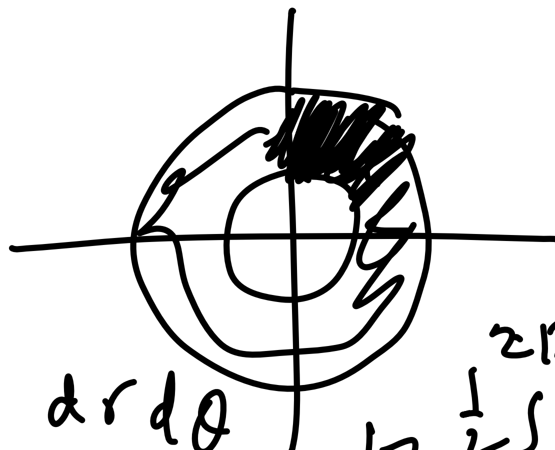
A. $\pi e^2 - \pi e$

B. $2\pi e^2 - 2\pi e$

C. $\pi e^4 - \pi e$

D. $2\pi e^2$

E. $6\pi e^4$



$$\int_0^{2\pi}\int_1^{2} e^{r^2}\cdot r\, dr\, d\theta$$

$$= \int_0^{2\pi} \frac{1}{2}\left[e^{r^2}\right]_1^{\sqrt{2}} d\theta$$

$$\frac{1}{2}\int_0^{2\pi}\left(e^{2} - e\right)$$

$$\pi\left(e^2 - e\right)$$

4. Find the volume of the part of the unit ball (radius 1, center at the origin) that lies between the cones $\phi = \pi/6$ and $\phi = \pi/3$.

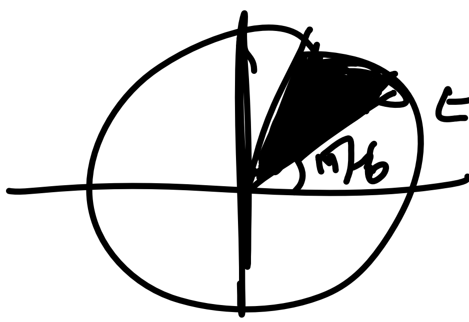
A. $\dfrac{\pi(\sqrt{2}-1)}{3}$

B. $\dfrac{\pi^2}{3}$

C. $\pi(\sqrt{3}-1)$

D. $\dfrac{\pi(\sqrt{3}-1)}{3}$

E. $\pi(\sqrt{2}-1)$



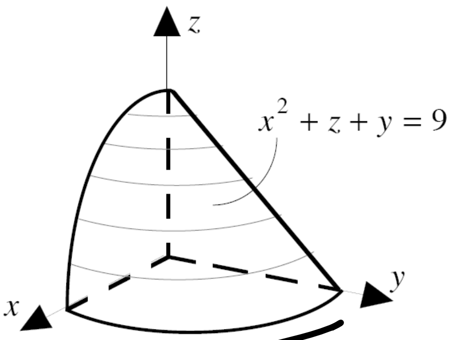
$x^2 + y^2 + z^2 = 1$

$$\int_0^{2\pi}\int_{\pi/6}^{\pi/3}\int_0^{1} \rho^2 \sin\varphi\, d\rho\, d\varphi\, d\theta$$

$$-\left(\cos\varphi\right)_{\pi/6}^{\pi/3}$$

$$= \frac{1}{3}\int_0^{2\pi}\int_{\pi/6}^{\pi/3} \sin\varphi\, d\varphi\, d\theta \to \frac{\sqrt{3}-1}{2}\left(\frac{1}{3}\right)2\pi$$

5. Which of the following is an **INCORRECT** setup for $\iiint\limits_E f(x,y,z)\ dV$, where E is the solid region in the first octant bounded by the surface $x^2+z+y=9$ and the three planes $x=0$, $y=0$, and $z=0$? (see figure below:)



$\sqrt{9-z}$

$x = \sqrt{9-y-z}$

A. $\int_0^3 \int_0^{9-x^2} \int_0^{9-y-x^2} f(x,y,z)\ dz\ dy\ dx$

B. $\int_0^9 \int_0^{9-z} \int_0^{9-z-x^2} f(x,y,z)\ dy\ dx\ dz$

C. $\int_0^3 \int_0^{9-x^2} \int_0^{9-z-x^2} f(x,y,z)\ dy\ dz\ dx$

D. $\int_0^9 \int_0^{9-z} \int_0^{\sqrt{9-z-y}} f(x,y,z)\ dx\ dy\ dz$

E. $\int_0^9 \int_0^{\sqrt{9-y}} \int_0^{9-y-x^2} f(x,y,z)\ dz\ dx\ dy$

6. Do NOT evaluate. Rewrite the integral in cylindrical coordinates.

$$\int_0^2 \int_0^{\sqrt{4-y^2}} \int_{\sqrt{x^2+y^2}}^{\sqrt{8-x^2-y^2}} \sqrt{x^2+y^2}\ dz\ dx\ dy$$

r

A. $\int_0^{\pi/2} \int_0^2 \int_r^{\sqrt{8-r^2}} r^2\ dz\ dr\ d\theta$

B. $\int_0^{\pi/2} \int_0^2 \int_r^{\sqrt{8-r^2}} r\ dz\ dr\ d\theta$

C. $\int_0^{\pi} \int_0^2 \int_r^{\sqrt{8-r^2}} r^2\ dz\ dr\ d\theta$

D. $\int_0^{\pi} \int_0^2 \int_r^{\sqrt{8-r^2}} r\ dz\ dr\ d\theta$

E. None of the above.

$$\int_0^{\pi/2} \int_0^2 \int_r^{\sqrt{8-r^2}} r^2\ dz\ dr\ d\theta$$

0 $x^2+y^2=2$

7. Find the surface area of the part of the paraboloid $z = 2 - x^2 - y^2$ that lies above the xy-plane.

d

A. $\dfrac{(3\sqrt{3}-1)\pi}{2}$

B. $\dfrac{17\sqrt{17}\pi}{6}$

C. $\dfrac{13\pi}{3}$

D. $2\sqrt{2}\pi$

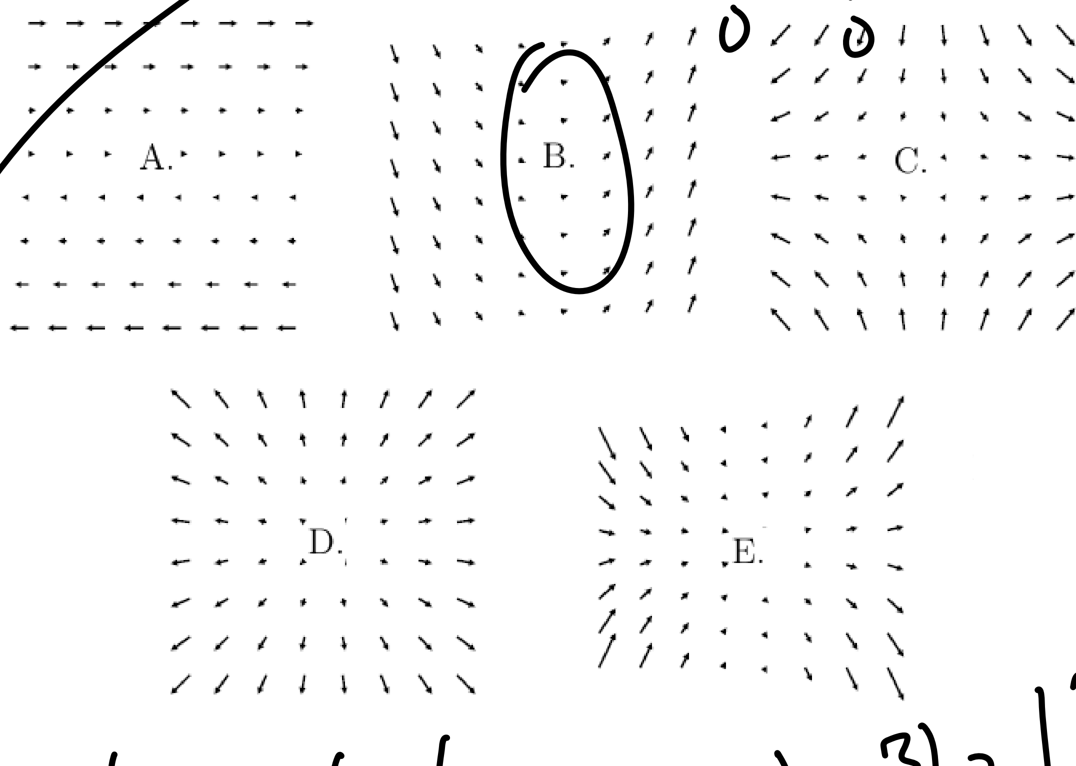
E. $\dfrac{11\pi}{6}$

arc length $= \langle -2x, -2y, 1 \rangle$

$$\int_0^{\sqrt{2}}\int_0^{\sqrt{2}} \sqrt{1+4x^2+4y^2}\,dx\,dy$$

$$\int_0^{2\pi}\int_0^{\sqrt{2}} r\sqrt{1+4r^2}\,dr\,d\theta$$

8. Select the correct plot for the vector field $\mathbf{F}(x, y) = \mathbf{i} + x\mathbf{j}$.



$$\frac{1}{\cancel{8}\,\cancel{4}\,2}\cdot \cancel{2}\pi\left(\frac{\cancel{2}}{3}\right)(1+4r^2)^{3/2}\Big|_0^{\sqrt{2}} \qquad \frac{\pi}{6}(27-1) \qquad \frac{13\pi}{3}$$

$1+2t+2+2t \cdot 1+2t$

$3\int 1+2t+1+t+1+2t \, dt$

9. Evaluate the line integral

$4+6t$

$$\int_C (x + 2y + z)\, ds$$

where C is the line segment from $(1, 1, 1)$ to $(3, 2, 3)$.

A. 5/3

B. 7

C. 11

D. 14

E. 21

$r(t)\ 1+2t,\ (1+t),\ 1+2t$

$|r'(t)| = \sqrt{4+1+4}$

$3\int_0^1 4+6t\, dt = \left(4t+3t^2\right)\Big|_0^1$

$3 \times 7 = 21$

10. Evaluate $\int_C \mathbf{F} \cdot d\mathbf{r}$, where $\mathbf{F}(x, y) = xy\mathbf{i} - y\mathbf{j}$ and C is given by $\mathbf{r}(t) = t\mathbf{i} + t^2\mathbf{j}$, $0 \le t \le 1$.

A. 1

B. -1

C. $\frac{1}{4}$

D. 0

E. $-\frac{1}{4}$