MA261 Exam 2 Summer 2016

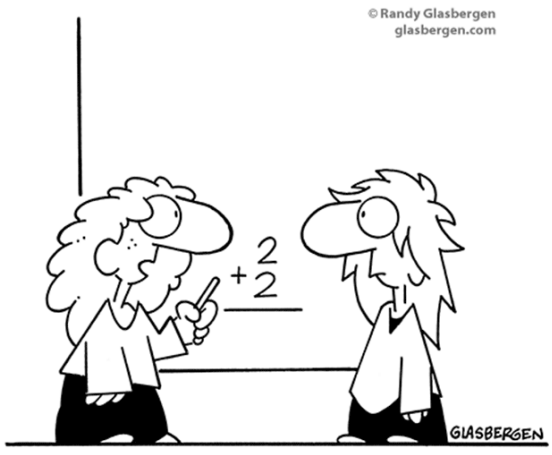
Name: _____

Student ID: _____

Instructor: Asaduzzaman Mohammad

Time: 60 minutes

- Write your name and student ID number in the space provided above
- There are 9 problems on 8 pages (including cover page and extra sheet).
- No books or notes allowed. No calculators allowed.
- For all problems (unless otherwise mentioned), you **MUST** show sufficient work to justify your answers. **Partial credits will be awarded for all the right steps.**
- **Place your SIMPLIFIED final answers in the box provided**. Points will be deducted if the answer is not simplified.
- The exam is self-explanatory! Please do not ask the instructor to interpret any question(s)
- Cheating of any form will NOT be tolerated!!
- Remember to check your answers before turning in the exam!
- Finally, do NOT panic – believe in yourself and be confident!! ☺



"First they build up your confidence with simple addition and subtraction, then they slam you with algebra and calculus. It's quite a clever scheme."

1. [10 points] Find the directional derivative of $f(x,y,z)=x^2y+x\sqrt{1+z}$ at the point $(1,2,3)$ in the direction of $\vec{v}=\langle 2,1,-2\rangle$

[Choose the correct answer- No partial credits for this problem]

A) $\frac{25}{6}$

B) $\frac{25}{3}$

C) $\frac{25}{2}$

D) 4

E) 12

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2. [10 points] There are two critical points of the function $f(x,y)=x^3-6xy+8y^3$, they are respectively:

[Choose the correct answer- No partial credits for this problem]

A) A saddle point and a local maximum.

B) A saddle point and a local minimum.

C) Two saddle points.

D) Two local maxima.

E) Two local minima.

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3. [10 points] If *C* is the curve that travels along $x^2 + y^2 = 4$ counter-clockwise from the point $(2,0)$ to $(0,2)$, then evaluate $\int_C 2xy\, ds$

[Choose the correct answer- No partial credits for this problem]

A) 2π

B) $\pi/2$

C) 2

D) 6

E) 8

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4. [10 points] Evaluate the double integral $\int_0^{\pi}\int_y^{\pi} \frac{\sin x}{x} dxdy$

[Choose the correct answer- No partial credits for this problem]

A) 1

B) -1

C) 0

D) 2

E) -2

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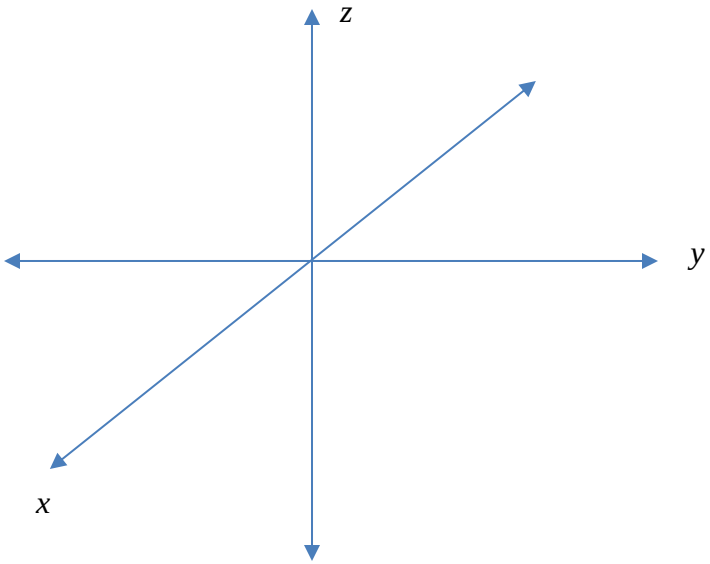
5. [12 points] Sketch (also shade the region) and find the volume of the solid in the first octant bound by the surfaces $x^2 + z^2 = 9$, $y = 2x$, $y = 0$, $z = 0$



6. A) [5 points]Plot the curve $r = 4\cos(2\theta)$

Use the following values (ONLY for part A):

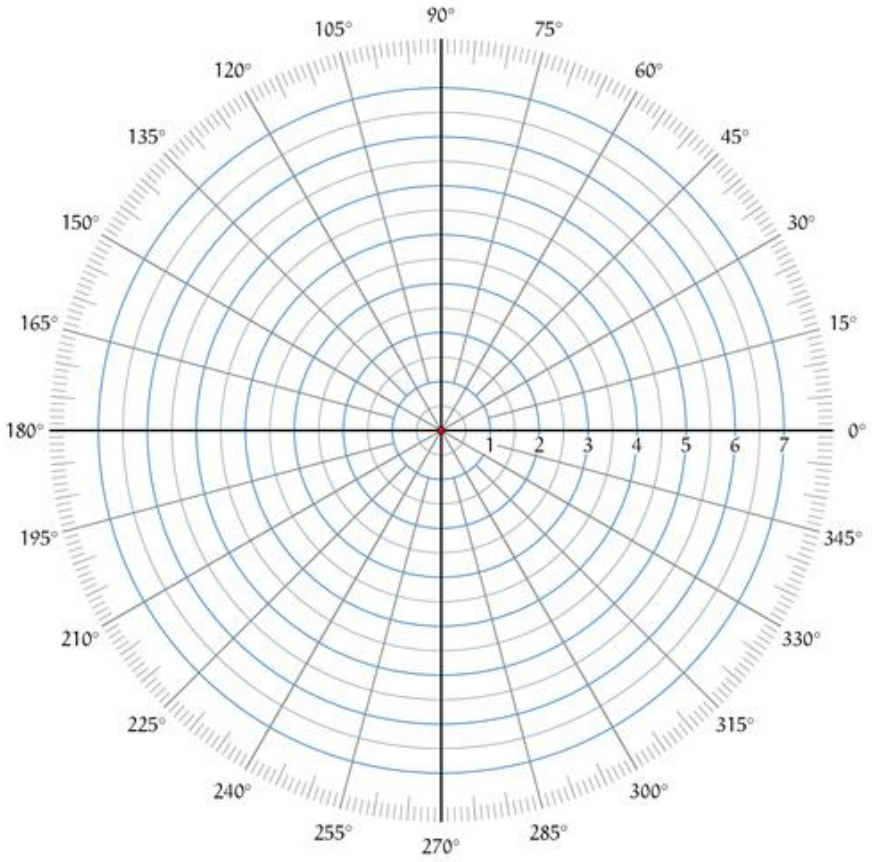
$\cos(0^\circ) = 1$

$\cos(30^\circ) = 0.87$

$\cos(45^\circ) = 0.71$

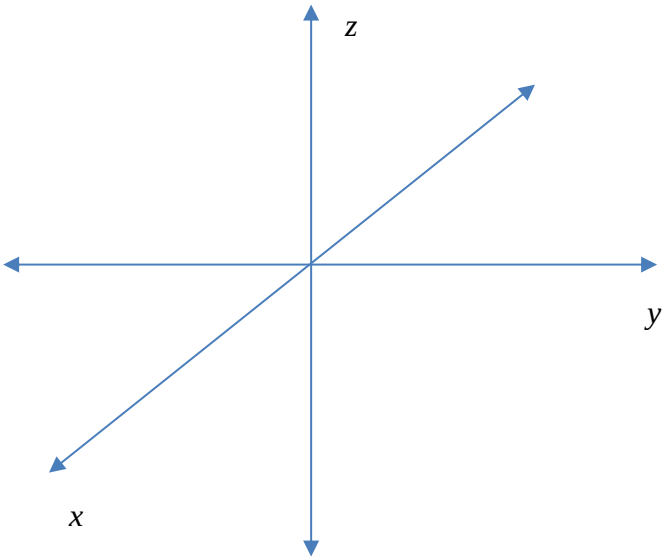
$\cos(60^\circ) = 0.5$

$\cos(90^\circ) = 0$



B) [7 points] Find the area enclosed by <u>one of the loops</u> of $r = 4\cos(2\theta)$**. (Leave answer in terms of π NOT in decimal values).**

7. [13 points] Find the surface area of the part of the sphere $x^2 + y^2 + z^2 = 4z$ that lies inside the paraboloid $z = x^2 + y^2$



8. [13 points] Given mass, $m = \iiint_E f(x,y,z)\,dV$ **where the density function is given by** $f(x,y,z) = 6\left(x^2+y^2+z^2\right)^{3/2}$**. Using <u>spherical coordinates</u>, find the mass of the region above the plane** $z = 0$ **and between the surfaces of** $x^2+y^2+z^2 = 1$ **and** $x^2+y^2+z^2 = 4$**.**

9. [10 points] Using <u>Lagrange multipliers</u> find and specify the extreme values (maximum and/or minimum values) of $f(x,y)=e^{xy}$ subject to the given constraint $x^3+y^3=16$.