NAME: ____________________________________

Advanced Calculus II - Fall 2016

Midterm Exam I, September 23, 2016

In all multiple choice problems you don't have to show your work. In all non-multiple choice problems you are required to show all your work and provide the necessary explanations everywhere to get full credit.

This print-out should have 11 questions. Multiple-choice questions may continue on the next column or page – find all choices before answering.

ParallelFace05c
001 10.0 points

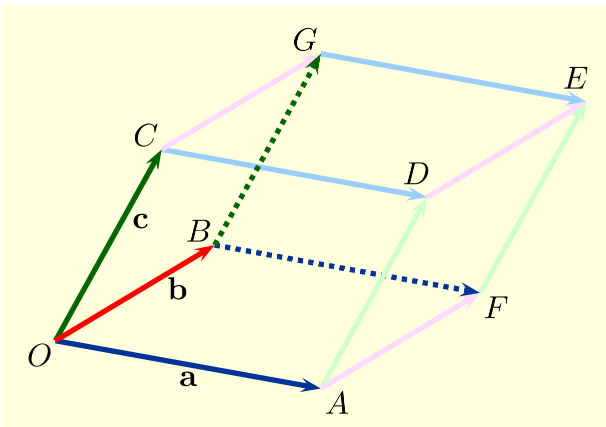
The vectors

$$\mathbf{a} = \langle 4, -3, -4\rangle, \quad \mathbf{b} = \langle 2, -1, -3\rangle,$$

and

$$\mathbf{c} = \langle 1, 2, 1\rangle,$$

shown below form adjacent edges of the parallelepiped



Describe the face $CDEG$ in vector form.

1.

$$\langle 2+4s+t,\ -1-3s+2t,\ -3-4s+t\rangle,$$

for, $\quad 0 \le s,\, t \le 1.$

2.

$$\langle 1+4s+2t,\ 2-3s-t,\ 1-4s-3t\rangle,$$

for $\quad 0 \le s,\, t \le 1.$

3.

$$\langle 4+2s+t,\ -3-s+2t,\ -4-3s+t\rangle,$$

for, $\quad -1 \le s,\, t \le 1.$

4.

$$\langle s+2t,\ 2s-t,\ s-3t\rangle,$$

for $\quad 0 \le s,\, t \le 1.$

5.

$$\langle 2s+t,\ -s+2t,\ -3s+t\rangle,$$

for $\quad -1 \le s,\, t \le 1.$

6.

$$\langle 1+4s+2t,\ 2-3s-t,\ 1-4s-3t\rangle,$$

for $\quad -1 \le s,\, t \le 1.$

CalC13a30aNC
002 10.0 points

Find an equation for the set of all points in 3-space equidistant from the points

$$A(-2, 2, -1), \qquad B(2, 4, 2).$$

1. $4x - 6y + 8z + 15 = 0$

2. $4x + 8y - 6z - 15 = 0$

3. $8x + 4y + 6z - 15 = 0$

4. $6x + 4y + 8z + 15 = 0$

5. $6x - 8y - 4z - 15 = 0$

6. $8x + 4y + 6z + 15 = 0$

CalC13d12s
003 10.0 points

If $\mathbf{a}$ is a vector parallel to the xy-plane and $\mathbf{b}$ is a vector parallel to $\mathbf{k}$, determine $\|\mathbf{a} \times \mathbf{b}\|$ when $\|\mathbf{a}\| = 3$ and $\|\mathbf{b}\| = 2$.

1. $\|\mathbf{a} \times \mathbf{b}\| = -3$

2. $\|\mathbf{a} \times \mathbf{b}\| = 6$

3. $\|\mathbf{a} \times \mathbf{b}\| = 3\sqrt{2}$

4. $\|\mathbf{a} \times \mathbf{b}\| = 0$

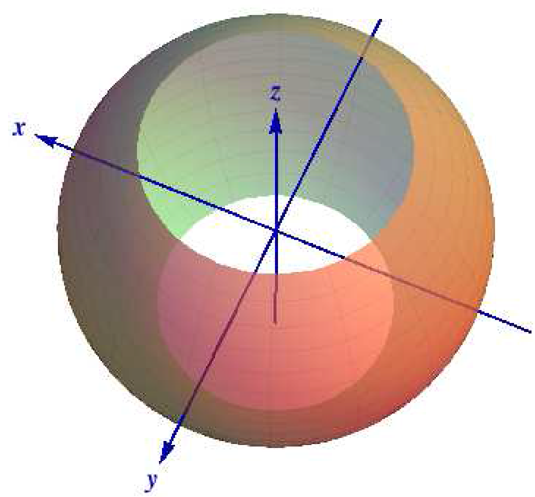
5. $\|\mathbf{a} \times \mathbf{b}\| = 3$

6. $\|\mathbf{a} \times \mathbf{b}\| = -3\sqrt{2}$

7. $\|\mathbf{a} \times \mathbf{b}\| = -6$

SphericalCoords04click
004 10.0 points

The surface S shown in



consists of the portion of the sphere

$$x^2 + y^2 + z^2 \;=\; 16$$

where

$$x^2 + y^2 \;\geq\; 4\,.$$

Use spherical polar coordinates $(\rho,\, \theta,\, \phi)$ to describe S.

1. $S =$ all points $P(\rho,\, \theta,\, \phi)\}$ with

$$\rho = 4,\ \ 0 \leq \theta \leq 2\pi,\ \ \frac{\pi}{3} \leq \phi \leq \frac{2\pi}{3}\,.$$

2. $S =$ all points $P(\rho,\, \theta,\, \phi)\}$ with

$$\rho = 2,\ \ 0 \leq \theta \leq 2\pi,\ \ \frac{\pi}{3} \leq \phi \leq \pi\,.$$

3. $S =$ all points $P(\rho,\, \theta,\, \phi)\}$ with

$$\rho = 2,\ \ 0 \leq \theta \leq 2\pi,\ \ \frac{\pi}{3} \leq \phi \leq \frac{2\pi}{3}\,.$$

4. $S =$ all points $P(\rho,\, \theta,\, \phi)$ with

$$\rho = 4,\ \ 0 \leq \theta \leq 2\pi,\ \ \frac{\pi}{6} \leq \phi \leq \frac{5\pi}{6}\,.$$

5. $S =$ all points $P(\rho,\, \theta,\, \phi)\}$ with

$$\rho = 4,\ \ 0 \leq \theta \leq 2\pi,\ \ \frac{\pi}{6} \leq \phi \leq \pi\,.$$

6. $S =$ all points $P(\rho,\, \theta,\, \phi)\}$ with

$$\rho = 2,\ \ 0 \leq \theta \leq 2\pi,\ \ \frac{\pi}{6} \leq \frac{5\pi}{6}\,.$$

FinM4e05
005 10.0 points

Solve for X when $AX + B = C$,

$$A = \begin{bmatrix} 1 & 2 \\ 2 & 3 \end{bmatrix},\ \ B = \begin{bmatrix} 6 & 2 \\ -1 & 2 \end{bmatrix},$$

and

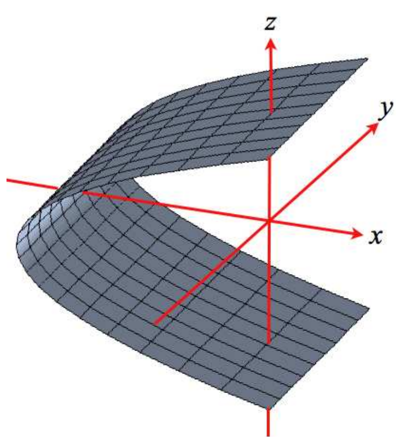
$$C = \begin{bmatrix} 2 & 2 \\ 1 & 2 \end{bmatrix}.$$

5. $x + y^2 - 4 \;=\; 0$

6. $z + x^2 - 4 \;=\; 0$

CalC13f04c
006 10.0 points

Which one of the following equations has graph



1. $x - z^2 + 4 \;=\; 0$

2. $z - y^2 + 4 \;=\; 0$

3. $y - x^2 + 4 \;=\; 0$

4. $y + z^2 - 4 \;=\; 0$

CalC15b16s
007 10.0 points

Find $\displaystyle\lim_{(x,y)\to(0,0)} \frac{7xy^4}{x^2+y^8}$, if it exists.

CalC15d11s
008 10.0 points

Find the linearization, $L(x, y)$, of

$$f(x, y) = y\sqrt{x}$$

at the point $(4, -2)$.

1. $L(x, y) = -4 + x + \frac{1}{2}y$
2. $L(x, y) = 2 - \frac{1}{2}x + 2y$
3. $L(x, y) = -2 + \frac{1}{2}x + 2y$
4. $L(x, y) = -2 + 2x + \frac{1}{2}y$
5. $L(x, y) = -4 + \frac{1}{2}x - y$
6. $L(x, y) = 2 + 2x - \frac{1}{2}y$

Tangent01a
009 10.0 points

If $\mathbf{r}(x)$ is the vector function whose graph is trace of the surface

$$z = f(x, y) = 3x^2 - y^2 - 3x + 3y$$

on the plane $y = 2x$, determine the tangent vector to $\mathbf{r}(x)$ at $x = 1$.

CalC15e07s
010 10.0 points

Use the Chain Rule to find $\dfrac{\partial z}{\partial s}$ when

$$z = x^2 + 3xy + y^2 ,$$

and

$$x = 4s - t , \qquad y = st .$$

1. $\dfrac{\partial z}{\partial s} = -2x + 12y + 3xs + 2ys$
2. $\dfrac{\partial z}{\partial s} = -2x - 3y + 3xs + 2ys$
3. $\dfrac{\partial z}{\partial s} = 8x + 12y + 3xs + 2ys$
4. $\dfrac{\partial z}{\partial s} = 8x + 12y + 3xt + 2yt$
5. $\dfrac{\partial z}{\partial s} = 8x - 3y + 3xt + 2yt$
6. $\dfrac{\partial z}{\partial s} = -2x - 3y + 3xt + 2yt$

CalC15f11s
011 10.0 points

Find the directional derivative, $f_{\mathbf{v}}$, of the function

$$f(x, y) = 4 + x\sqrt{y}$$

at the point $P(3, 9)$ in the direction of the vector

$$\mathbf{v} = \langle 3, 4 \rangle .$$

1. $f_{\mathbf{v}} = \dfrac{32}{15}$
2. $f_{\mathbf{v}} = \dfrac{31}{15}$
3. $f_{\mathbf{v}} = \dfrac{11}{5}$
4. $f_{\mathbf{v}} = \dfrac{34}{15}$
5. $f_{\mathbf{v}} = 2$