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

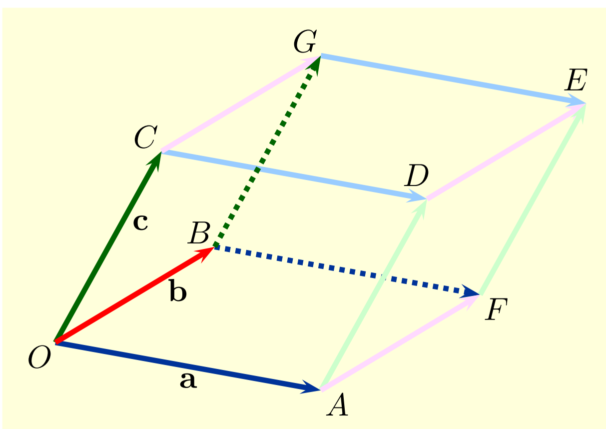
The vectors

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

and

$$\mathbf{c} = \langle 2, 2, 4 \rangle,$$

shown below form adjacent edges of the parallelepiped



Describe the face $CDEG$ in vector form.

1.

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

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

2.

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

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

3.

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

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

4.

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

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

5.

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

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

6.

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

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

CalC13a30aNC
002 10.0 points

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

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

1. $2x + 4y + 8z - 3 = 0$

2. $8x + 4y + 2z + 3 = 0$

3. $2x + 4y + 8z + 3 = 0$

4. $4x - 8y + 2z + 3 = 0$

5. $4x + 2y - 8z - 3 = 0$

6. $8x \quad 2y \quad 4z \quad 3 = 0$

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 $\|\mathbf{a}\| = 2$ and $\|\mathbf{b}\| = 4$.

1. $\|\mathbf{a} \times \mathbf{b}\| = -4\sqrt{2}$

2. $\|\mathbf{a} \times \mathbf{b}\| = 4\sqrt{2}$

3. $\|\mathbf{a} \times \mathbf{b}\| = 8$

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

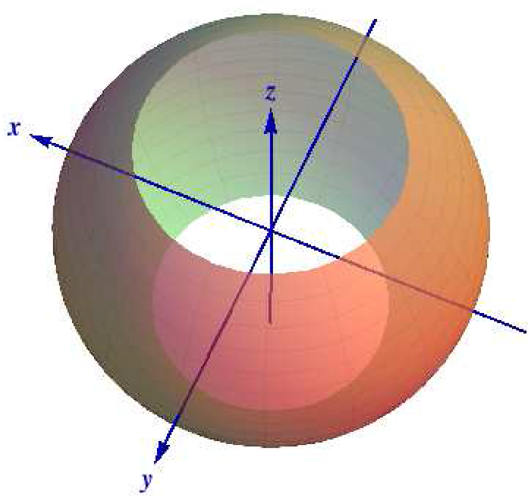
5. $\|\mathbf{a} \times \mathbf{b}\| = -8$

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

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

SphericalCoords04click
004 10.0 points

The surface S shown in



consists of the portion of the sphere

$$x^2 + y^2 + z^2 = 4$$

where

$$x^2 + y^2 \geq 1\,.$$

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

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

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

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

$$\rho = 1,\ \ 0 \leq \theta \leq 2\pi,\ \ \frac{\pi}{3} \leq \phi \leq \frac{2\pi}{3}\,.$$

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

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

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

$$\rho = 1,\ \ 0 \leq \theta \leq 2\pi,\ \ \frac{\pi}{6} \leq \leq \frac{5\pi}{6}\,.$$

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

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

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

$$\rho = 1,\ \ 0 \leq \theta \leq 2\pi,\ \ \frac{\pi}{3} \leq \phi \leq \pi\,.$$

FinM4e05
005 10.0 points

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

$$A = \begin{bmatrix} 1 & 2 \\ 2 & 3 \end{bmatrix},\ \ B = \begin{bmatrix} 2 & 2 \\ -1 & 4 \end{bmatrix},$$

and

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

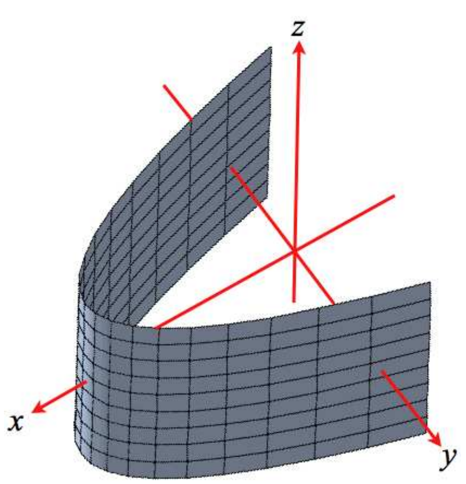
4. $z + x^2 - 4 = 0$

5. $x - z^2 + 4 = 0$

6. $y + z^2 - 4 = 0$

CalC13f04c
006 10.0 points

Which one of the following equations has graph



1. $y - x^2 + 4 = 0$

2. $x + y^2 - 4 = 0$

3. $z - y^2 + 4 = 0$

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 (9, 1).

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

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

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

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

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

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

Tangent01a
009 10.0 points

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

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

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

$$x = 2s + 4t, \qquad y = st.$$

1. $\dfrac{\partial z}{\partial s} = 4x + 12y + 3xt + 2yt$

2. $\dfrac{\partial z}{\partial s} = 8x + 12y + 3xt + 2yt$

3. $\dfrac{\partial z}{\partial s} = 8x + 12y + 3xs + 2ys$

4. $\dfrac{\partial z}{\partial s} = 8x + 6y + 3xs + 2ys$

5. $\dfrac{\partial z}{\partial s} = 4x + 6y + 3xt + 2yt$

6. $\dfrac{\partial z}{\partial s} = 4x + 6y + 3xs + 2ys$

CalC15f11s
011 10.0 points

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

$$f(x, y) = 7 + 2x\sqrt{y}$$

at the point $P(1, 9)$ in the direction of the vector

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

1. $f_{\mathbf{v}} = \dfrac{58}{15}$

2. $f_{\mathbf{v}} = 4$

3. $f_{\mathbf{v}} = \dfrac{61}{15}$

4. $f_{\mathbf{v}} = \dfrac{59}{15}$

5. $f_{\mathbf{v}} = \dfrac{62}{15}$