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

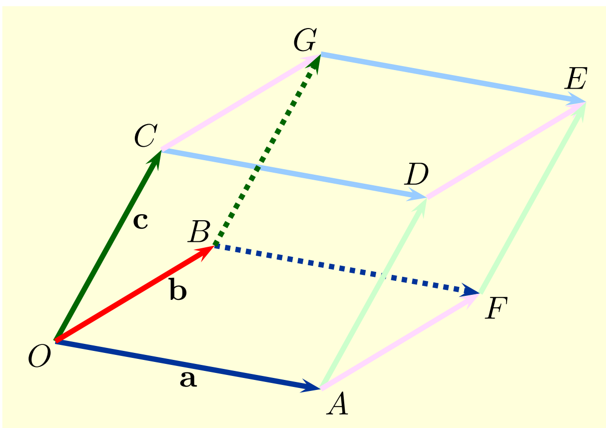
The vectors

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

and

$$\mathbf{c} = \langle 1, 4, 4 \rangle,$$

shown below form adjacent edges of the parallelepiped



Describe the face $CDEG$ in vector form.

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

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

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

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

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

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

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

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

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

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

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

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

CalC13a30aNC
002 10.0 points

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

$$A(-3, -1, 3), \qquad B(1, 2, 4).$$

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

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

3. $4x + 3y + z + 1 = 0$

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

5. $4x + 3y + z - 1 = 0$

6. $x - 4y - 3z - 1 = 0$

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 $\|\mathbf{b}\| = 3$.

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

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

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

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

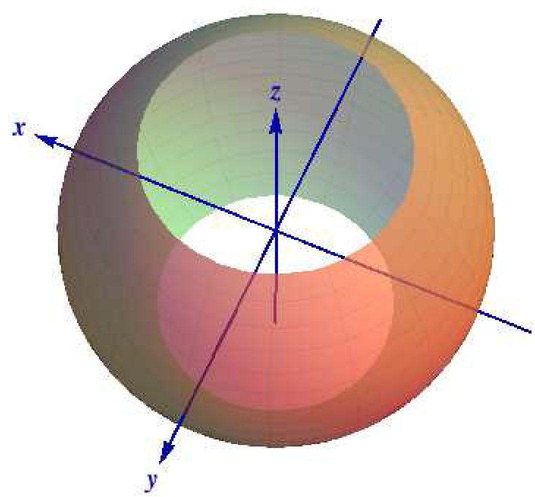
5. $\|\mathbf{a} \times \mathbf{b}\| = 6$

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

7. $\mathbf{a} \quad \mathbf{b} = 3\sqrt{2}$

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 (ρ, θ, ϕ) to describe S.

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

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

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

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

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

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

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

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

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

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

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

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

FinM4e05
005 10.0 points

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

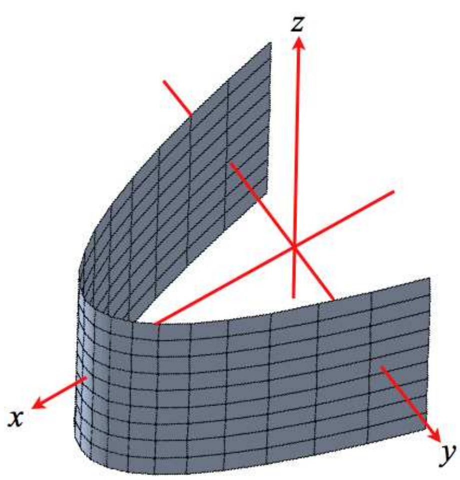
$$A = \begin{bmatrix} 1 & 2 \\ 2 & 3 \end{bmatrix}, \quad B = \begin{bmatrix} 5 & 2 \\ -1 & 2 \end{bmatrix},$$

and

$$C = \begin{bmatrix} 2 & 2 \\ 1 & 4 \end{bmatrix}.$$

CalC13f04c
006 10.0 points

Which one of the following equations has graph



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

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

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

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

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

6. $x + y^2 \quad 4 \;=\; 0$

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 $(9, -2)$.

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

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

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

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

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

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

Tangent01a
009 10.0 points

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

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

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

$$z = x^2 - 4xy + y^2,$$

and

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

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

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

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

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

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

6. $\dfrac{\partial z}{\partial s} = 4x - 8y - 4xt + 2yt$

CalC15f11s
011 10.0 points

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

$$f(x, y) = 6 + 2x\sqrt{y}$$

at the point $P(3, 4)$ in the direction of the vector

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

1. $f_{\mathbf{v}} = \dfrac{4}{5}$

2. $f_{\mathbf{v}} = \dfrac{11}{10}$

3. $f_{\mathbf{v}} = 1$

4. $f_{\mathbf{v}} = \dfrac{9}{10}$

5. $f_{\mathbf{v}} = \dfrac{6}{5}$