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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

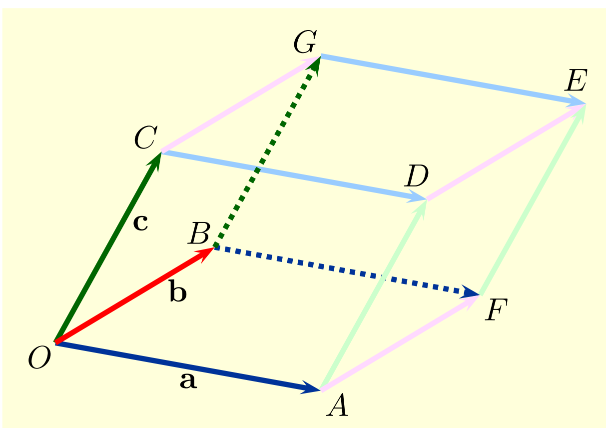
The vectors

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

and

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

shown below form adjacent edges of the parallelepiped



Describe the face $CDEG$ in vector form.

1.

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

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

2.

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

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

3.

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

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

4.

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

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

5.

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

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

6.

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

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

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

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

2. $3x + 4y + z + 6 \;=\; 0$

3. $3x + 4y + z - 6 \;=\; 0$

4. $x + 4y + 3z + 6 \;=\; 0$

5. $4x - y + 3z + 6 \;=\; 0$

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

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 $\|\mathbf{a}\| = 1$ and $\|\mathbf{b}\| = 4$.

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

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

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

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

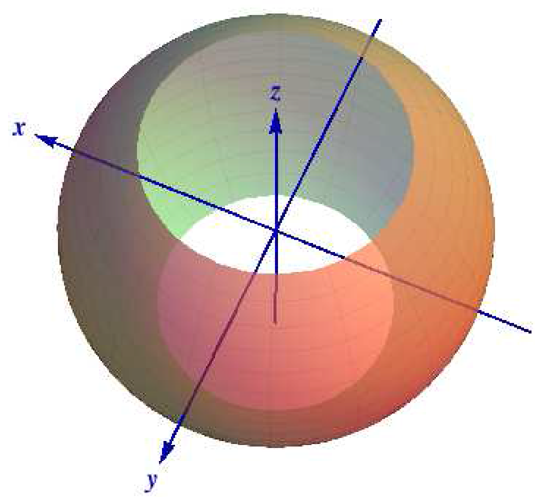
5. $\|\mathbf{a} \times \mathbf{b}\| \;=\; -2\sqrt{2}$

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

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

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

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

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

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

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

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

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

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

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

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

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 $AX + B = C$,

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

and

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

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

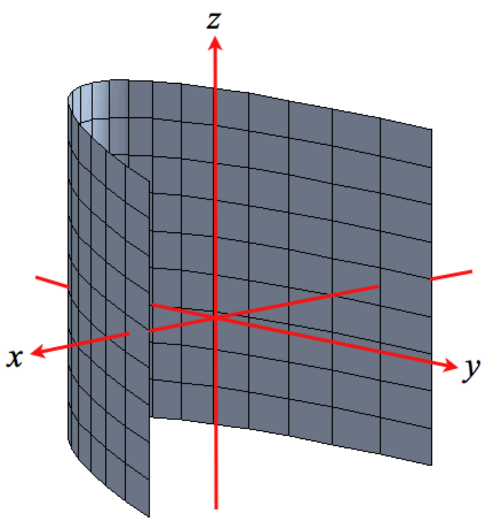
4. $y - x^2 + 4 = 0$

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

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

CalC13f04c
006 10.0 points

Which one of the following equations has graph



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

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

CalC15b16s
007 10.0 points

Find $\displaystyle\lim_{(x,y)\to(0,0)} \frac{3xy^4}{x^2+y^8}$, if it exists.

CalC15d11s

008 10.0 points

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

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

at the point (2, 9).

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

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

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

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

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

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

Tangent01a

009 10.0 points

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

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

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 $\frac{\partial z}{\partial s}$ when

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

and

$$x = 3s + t \,, \qquad y = st \,.$$

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

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 $P(1, 1)$ in the direction of the vector

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

1. $f_{\mathbf{v}} = \frac{6}{5}$
2. $f_{\mathbf{v}} = \frac{2}{5}$
3. $f_{\mathbf{v}} = \frac{4}{5}$
4. $f_{\mathbf{v}} = \frac{3}{5}$
5. $f_{\mathbf{v}} = 1$