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

QuadApprox02a
001 10.0 points

Find the quadratic approximation to

$$f(x,\, y) \;=\; \cos(x+y) - 2\sin(x-y)$$

at $P(0,\, 0)$.

1. $Q(x,\, y) \;=\; 2 - 2x + 2y + \frac{1}{2}x^2 + xy - \frac{1}{2}y^2$

2. $Q(x,\, y) \;=\; 1 + 2x - 2y + \frac{1}{2}x^2 - xy + y^2$

3. $Q(x,\, y) \;=\; 2 - 2x + 2y + \frac{1}{2}x^2 - xy + y^2$

4. $Q(x,\, y) \;=\; 2 - 2x + 2y - \frac{1}{2}x^2 + xy - \frac{1}{2}y^2$

5. $Q(x,\, y) \;=\; 1 - 2x + 2y - \frac{1}{2}x^2 - xy - \frac{1}{2}y^2$

6. $Q(x,\, y) \;=\; 1 + 2x - 2y - \frac{1}{2}x^2 + xy + y^2$

CalC15g19b
002 10.0 points

Locate and classify the critical point of

$$f(x,y) \;=\; \ln(xy) + 2y^2 - y - 2xy + 3,$$

for $x, y > 0$.

1. local maximum at $\left(2,\, \frac{1}{4}\right)$

2. saddle-point at $\left(\frac{1}{4},\, 2\right)$

3. local minimum at $\left(\frac{1}{4},\, 2\right)$

4. local maximum at $\left(\frac{1}{4},\, 2\right)$

5. local minimum at $\left(2,\, \frac{1}{4}\right)$

6. saddle-point at $\left(2,\, \frac{1}{4}\right)$

respectively.

1. $\mathbf{r}(t) = (t-3)\,\mathbf{i} + (t+5)\,\mathbf{j} - (3t^2 - 4t)\,\mathbf{k}$

2. $\mathbf{r}(t) = (t+3)\,\mathbf{i} + (t+5)\,\mathbf{j} - (3t^2 + 4t)\,\mathbf{k}$

3. $\mathbf{r}(t) = (t-3)\,\mathbf{i} + (t+5)\,\mathbf{j} - (3t^2 + 4t)\,\mathbf{k}$

4. $\mathbf{r}(t) = (t+3)\,\mathbf{i} - (t-5)\,\mathbf{j} - (3t^2 + 4t)\,\mathbf{k}$

5. $\mathbf{r}(t) = (t+3)\,\mathbf{i} - (t-5)\,\mathbf{j} - (3t^2 - 4t)\,\mathbf{k}$

6. $\mathbf{r}(t) = (t+3)\,\mathbf{i} + (t+5)\,\mathbf{j} - (3t^2 - 4t)\,\mathbf{k}$

CalC14d16s
003 10.0 points

Determine the position vector, $\mathbf{r}(t)$, of a particle having acceleration

$$\mathbf{a}(t) = -6\,\mathbf{k}$$

when its initial velocity and position are given by

$$\mathbf{v}(0) = \mathbf{i} + \mathbf{j} - 4\,\mathbf{k}\,, \quad \mathbf{r}(0) = 3\,\mathbf{i} + 5\,\mathbf{j}$$

CalC14c04a
004 10.0 points

The curve C is parametrized by

$$\mathbf{c}(t) = (5-2t)\mathbf{i} + \ln(4t)\,\mathbf{j} + (2-t^2)\mathbf{k}\,.$$

Find the arc length of C between $\mathbf{c}(1)$ and $\mathbf{c}(2)$.

GradVectorField01a

005 10.0 points

If $f(x, y)$ is a potential function for the gradient vector field

$$\mathbf{F}(x, y) = (4x+y)\,\mathbf{i} + (x+2y)\,\mathbf{j}\,,$$

evaluate

$$f(1, 2) - f(0, 1)\,.$$

Curl01a
006 10.0 points

Find the curl of the vector field

$$\mathbf{F}(x,\, y,\, z) \;=\; zx\,\mathbf{i} - 2xy\,\mathbf{j} + 3yz\,\mathbf{k}\,.$$

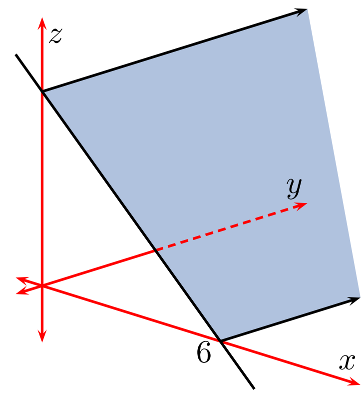
1. $\operatorname{curl}\mathbf{F} \;=\; -2x\,\mathbf{i} - 3y\,\mathbf{j} - z\,\mathbf{k}$
2. $\operatorname{curl}\mathbf{F} \;=\; 3z\,\mathbf{i} - x\,\mathbf{j} - 2y\,\mathbf{k}$
3. $\operatorname{curl}\mathbf{F} \;=\; x\,\mathbf{i} - 2y\,\mathbf{j} + 3z\,\mathbf{k}$
4. $\operatorname{curl}\mathbf{F} \;=\; z\,\mathbf{i} + 2x\,\mathbf{j} + 3y\,\mathbf{k}$
5. $\operatorname{curl}\mathbf{F} \;=\; -2x\,\mathbf{i} + 3y\,\mathbf{j} + z\,\mathbf{k}$
6. $\operatorname{curl}\mathbf{F} \;=\; 3z\,\mathbf{i} + x\,\mathbf{j} - 2y\,\mathbf{k}$

CalC16b01a
007 10.0 points

The graph of the function

$$z \;=\; f(x,\, y) \;=\; 6 - x$$

is the plane shown in



Determine the value of the double integral

$$I \;=\; \int\!\!\int_A f(x,\, y)\, dxdy$$

over the region

$$A \;=\; \Big\{(x, y) : 0 \le x \le 4,\;\; 0 \le y \le 4\Big\}$$

in the xy-plane by first identifying it as the volume of a solid below the graph of f.

1. $I \;=\; 65$ cu. units
2. $I \;=\; 62$ cu. units
3. $I \;=\; 61$ cu. units

4. $I = 63$ cu. units

5. $I = 64$ cu. units

CalC16c05s
008 10.0 points

Evaluate the iterated integral

$$I = \int_0^{\pi/2} \int_0^{\cos(\theta)} 4\, e^{\sin(\theta)}\, dr\, d\theta\,.$$

1. $I = 4(e-1)$

2. $I = e-4$

3. $I = \dfrac{1}{e} - 4$

4. $I = 4\left(\dfrac{1}{e} - 1\right)$

5. $I = 0$

6. $I = 4e$

CalC16g01a
009 10.0 points

Evaluate the triple integral

$$I = \int_0^1 \int_0^x \int_0^{x+y} (3x - 2y)\, dz dy dx\,.$$

1. $I = \dfrac{5}{8}$

2. $I = \dfrac{7}{8}$

3. $I = \dfrac{17}{24}$

4. $I = \dfrac{13}{24}$

5. $I = \dfrac{19}{24}$

Div01a
010 10.0 points

Find the divergence of the vector field

$$\mathbf{F}(x,\, y,\, z) \;=\; 3x^2yz\,\mathbf{i} + 2xy^2z\,\mathbf{j} - xyz^2\,\mathbf{k}\,.$$

1. $\operatorname{div}\mathbf{F} \;=\; 6xyz$

2. $\operatorname{div}\mathbf{F} \;=\; 10xyz$

3. $\operatorname{div}\mathbf{F} \;=\; 7xyz$

4. $\operatorname{div}\mathbf{F} \;=\; 8xyz$

5. $\operatorname{div}\mathbf{F} \;=\; 9xyz$

CalC15h04exam
011 10.0 points

Determine the maximum value of

$$f(x,\, y) \;=\; 3x + 4y + 3$$

subject to the constraint

$$g(x,\, y) \;=\; x^2 + y^2 - 1 \;=\; 0\,.$$

i.e., $x = \pm 3/5$. Consequently, the extreme points are

$$\left(\frac{3}{5}, \frac{4}{5}\right), \quad \left(-\frac{3}{5}, -\frac{4}{5}\right).$$

Since

$$f\left(\frac{3}{5}, \frac{4}{5}\right) = 8, \quad f\left(-\frac{3}{5}, -\frac{4}{5}\right) = -2,$$

we thus see that

$$\boxed{\text{max value} = 8}.$$

---

keywords: