

KING FAHD UNIVERSITY OF PETROLEUM & MINERALS

DEPARTMENT OF MATHEMATICS & STATISTICS

MATH201 – Section 16 (Term 171)

Date: December 17, 2017

Test 5

Duration: 50 minutes

Family Name: _____ **ID #:** 201_____0 **Serial #:** ____

1. Use the **Second Derivative Test** to find the local extreme values (if any) of the function:

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

(12 points)

2. Use the Lagrange Multiplier method to find the extreme values of the function $f(x, y) = x^2 + 2y^2$ subject to the constraint $x^2 + y^2 = 9$.

(12 points)

3. Find the average value of the function

$$f(x, y) = \frac{\sqrt{y}}{x^2}$$

over the rectangle $R = [1, 2] \times [0, 4]$.

(8 points)

4. Evaluate the double integral

$$I = \int_1^2 \int_0^{\sqrt{2-y}} x e^{(2-y)^2} dx dy$$

(8 points)

5. Sketch the region of integration for the double integral

$$I = \int_0^1 \int_{\sqrt{x}}^1 \sin(\pi y^3) dy dx$$

and evaluate the integral.

(10 points)

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DEPARTMENT OF MATHEMATICS & STATISTICS

MATH201 - Section 19 (Term 171)

Date: December 17, 2017

Test 5

Duration: 50 minutes

Family Name: _____ ID #: 201_____0 Serial #: ____

1. Use the Lagrange Multiplier method to find the extreme values of the function $f(x, y) = x^2 + 2y^2$ subject to the constraint $x^2 + y^2 = 16$.

(12 points)

2. Find the absolute minimum and absolute maximum values of the function:

$$f(x, y) = x^2 + xy + y^2 - 6x$$

on the triangular region bound by the **lines** $y = x$, $y = 1$ and $x = 0$.

(12 points)

3. Evaluate the following integrals:

(a)
$$I = \int_1^2 \int_0^4 \frac{\sqrt{y}}{x^2} dy dx$$

(b)
$$I = \int_0^1 \int_{-3}^3 \frac{xy^2}{x^2 + 1} dy dx$$

(6 + 8 = 14 points)

4. Find the average value of the function

$$f(x, y) = x e^{(2-y)^2}$$

over the region in the first quadrant that bounded above by the parabola $y = 2 - x^2$ and bounded below by the line $y = 1$. **(12 points)**

[Hint: You may wish to sketch the domain and change its type.]

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DEPARTMENT OF MATHEMATICS & STATISTICS

MATH201 – Section 21 (Term 171)

Date: December 17, 2017

Test 5

Duration: 50 minutes

Family Name: _____ **ID #:** 201_____**0** **Serial #:** ____

1. Use the **Second Derivative Test** to find the local extreme values (if any) of the function:

$$f(x, y) = 3y^2 - 2y^3 - 3x^2 + 6xy$$

(10 points)

2. Use the Lagrange Multiplier method to find the extrema values of the function $f(x, y, z) = z - x^2 - y^2$ subject to the constraints $x + y + z = 1$ and $x^2 + y^2 = 4$. **(14 points)**

3. Find the average value of the function

$$f(x, y) = \frac{xe^x}{y}$$

over the rectangle $R = [0, 1] \times [1, 2]$.

(8 points)

4. Evaluate the double integral

$$I = \int_0^1 \int_{-3}^3 \frac{xy^2}{x^2 + 1} dy dx$$

(8 points)

5. Sketch the region of integration for the double integral

$$I = \int_0^8 \int_{x^{\frac{1}{3}}}^1 e^{(x^4)} dx dy$$

and evaluate the integral.

(10 points)