WeBWorK 標準問題集: 解析学 B

WeBWorK Standard Problems: Calculus B

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June 24, 2023

Match the functions with the graphs labeled A - G. As always, you may click on the thumbnail image to produce a larger image in a new window (sometimes exactly on top of the old one). Just take your time; process of elimination will help with ones that are not obvious.

? 1. $f(x, y) = 3 - x^2 - y^2$

? 2. $f(x, y) = \cos(x^2 + y^2)/(1 + x^2 + y^2)$

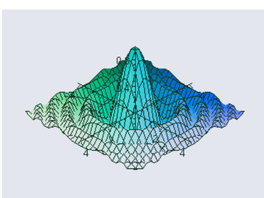
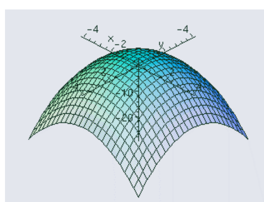
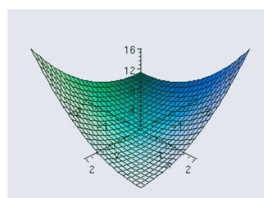
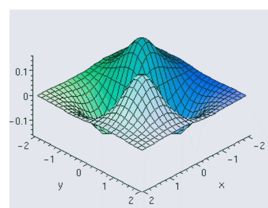
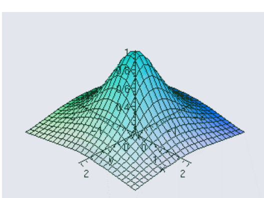
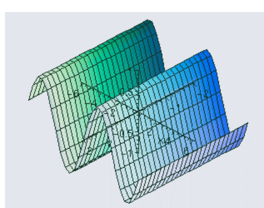
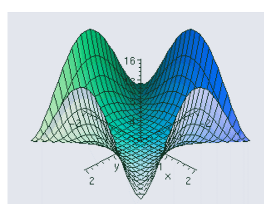
? 3. $f(x, y) = \sin(y)$

? 4. $f(x, y) = \sin(x)\sin(y)e^{-x^2-y^2}$

? 5. $f(x, y) = 1/(1 + x^2 + y^2)$

? 6. $f(x, y) = (x - y)^2$

? 7. $f(x, y) = (x^2 - y^2)^2$

			
A	B	C	D
			
E	F	G	

Match the functions with the graphs labeled A - G. As always, you may click on the thumbnail image to produce a larger image in a new window (sometimes exactly on top of the old one). Just take your time; process of elimination will help with ones that are not obvious.

B 1. $f(x,y) = 3 - x^2 - y^2$

A 2. $f(x,y) = \cos(x^2 + y^2)/(1 + x^2 + y^2)$

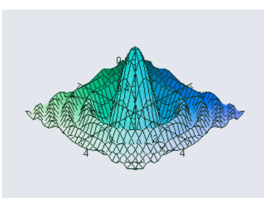
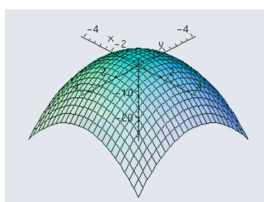
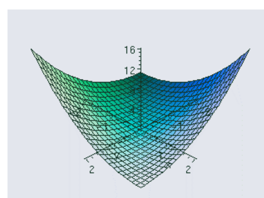
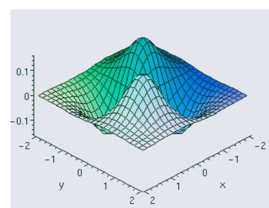
F 3. $f(x,y) = \sin(y)$

D 4. $f(x,y) = \sin(x)\sin(y)e^{-x^2-y^2}$

E 5. $f(x,y) = 1/(1 + x^2 + y^2)$

C 6. $f(x,y) = (x - y)^2$

G 7. $f(x,y) = (x^2 - y^2)^2$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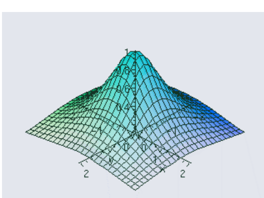
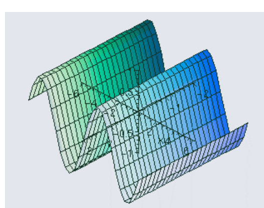
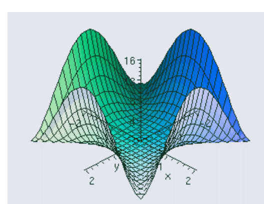
			
E	F	G	

Find the limit, if it exists, or type N if it does not exist.

$$\lim_{(x,y)\to(0,0)} \frac{3x^2}{4x^2+2y^2} = \boxed{}$$

Find the limit, if it exists, or type N if it does not exist.

$$\lim_{(x,y)\to(0,0)} \frac{3x^2}{4x^2+2y^2} = \boxed{\text{N}}$$

Find the limits, if they exist, or type DNE for any which do not exist.

$$\lim_{(x,y)\to(0,0)} \frac{5x^2}{4x^2+3y^2}$$

1) Along the x-axis: ______

2) Along the y-axis: ______

3) Along the line $y = mx$: ______

4) The limit is: ______

Find the limits, if they exist, or type DNE for any which do not exist.

$$\lim_{(x,y)\to(0,0)} \frac{5x^2}{4x^2+3y^2}$$

1) Along the x-axis: 1.25

2) Along the y-axis: 0

3) Along the line $y = mx$: $5/(4+3m^2)$

4) The limit is: DNE

Find the limit of the function

$$f(x,y) = \frac{\sin(5(x^2+y^2))}{5(x^2+y^2)}$$

as $(x,y) \to (0,0)$. Assume that polynomials, exponentials, logarithmic, and trigonometric functions are continuous. Hint: $\lim_{t\to 0} \frac{\sin t}{t} = 1$.

$$\lim_{(x,y)\to(0,0)} \frac{\sin(5(x^2+y^2))}{5(x^2+y^2)} = \boxed{}$$

Enter DNE if the limit does not exist.

Find the limit of the function

$$f(x,y) = \frac{\sin(5(x^2+y^2))}{5(x^2+y^2)}$$

as $(x,y) \to (0,0)$. Assume that polynomials, exponentials, logarithmic, and trigonometric functions are continuous. Hint: $\lim_{t\to 0} \frac{\sin t}{t} = 1$.

$$\lim_{(x,y)\to(0,0)} \frac{\sin(5(x^2+y^2))}{5(x^2+y^2)} = \boxed{1}$$

Enter DNE if the limit does not exist.

Find the limit (enter DNE if the limit does not exist). Hint: rationalize the denominator.

$$\lim_{(x,y)\to(0,0)} \frac{(8x^2-5y^2)}{\sqrt{(8x^2-5y^2+1)}-1} = \boxed{}$$

Find the limit (enter DNE if the limit does not exist). Hint: rationalize the denominator.

$$\lim_{(x,y)\to(0,0)} \frac{(8x^2 - 5y^2)}{\sqrt{(8x^2 - 5y^2 + 1)} - 1} = \boxed{2}$$

Find the first partial derivatives of $f(x, y) = \dfrac{2x - 2y}{2x + 2y}$ at the point $(x, y) = (1, 4)$.

$\dfrac{\partial f}{\partial x}(1, 4) =$ ______

$\dfrac{\partial f}{\partial y}(1, 4) =$ ______

Find the first partial derivatives of $f(x,y) = \dfrac{2x-2y}{2x+2y}$ at the point $(x,y) = (1,4)$.

$\dfrac{\partial f}{\partial x}(1,4) = \boxed{8/25}$

$\dfrac{\partial f}{\partial y}(1,4) = \boxed{-2/25}$

Compute the partial derivative: $f(x, y) = \sin\left(x^3 - 6y\right)$

$$f_y(0, \pi) = \boxed{}$$

Compute the partial derivative: $f(x,y) = \sin\left(x^3 - 6y\right)$

$$f_y(0,\pi) = \boxed{-6}$$

Find an equation of the tangent plane to the surface $z = -x^2 + 3y^2 - 2x - y - 2$ at the point $(1, 4, 39)$.

$$z = \boxed{}$$

Find an equation of the tangent plane to the surface $z = -x^2 + 3y^2 - 2x - y - 2$ at the point $(1, 4, 39)$.

$$z = \boxed{-4x + 23y - 49}$$

Find the equation of the tangent plane to $z = e^y + x + x^2 + 10$ at the point $(3, 0, 23)$.

$z =$ ______

Find the equation of the tangent plane to $z = e^y + x + x^2 + 10$ at the point $(3, 0, 23)$.

$z =$ $7x + y + 2$

Suppose

$$z = x^2 \sin y, \quad x = -s^2 + 2t^2, \quad y = 10st.$$

A. Use the chain rule to find $\frac{\partial z}{\partial s}$ and $\frac{\partial z}{\partial t}$ as functions of x, y, s and t.

$\frac{\partial z}{\partial s} =$ [ ]

$\frac{\partial z}{\partial t} =$ [ ]

B. Find the numerical values of $\frac{\partial z}{\partial s}$ and $\frac{\partial z}{\partial t}$ when $(s,t) = (5,-3)$.

$\frac{\partial z}{\partial s}(5,-3) =$ [ ]

$\frac{\partial z}{\partial t}(5,-3) =$ [ ]

Suppose

$$z = x^2 \sin y, \quad x = -s^2 + 2t^2, \quad y = 10st.$$

A. Use the chain rule to find $\frac{\partial z}{\partial s}$ and $\frac{\partial z}{\partial t}$ as functions of x, y, s and t.

$\frac{\partial z}{\partial s} = \boxed{-4sx\sin y + 10tx^2\cos y}$

$\frac{\partial z}{\partial t} = \boxed{8tx\sin y + 10sx^2\cos y}$

B. Find the numerical values of $\frac{\partial z}{\partial s}$ and $\frac{\partial z}{\partial t}$ when $(s,t) = (5,-3)$.

$\frac{\partial z}{\partial s}(5,-3) = \boxed{-140\sin(150) - 1470\cos(150)}$

$\frac{\partial z}{\partial t}(5,-3) = \boxed{-168\sin(150) + 2450\cos(150)}$

If

$$z = (x+y)\,e^{y}, \quad x = u^2 + v^2, \quad y = u^2 - v^2,$$

find the following partial derivatives using the chain rule. Enter your answers as functions of u and v.

$\dfrac{\partial z}{\partial u} =$ [ ]

$\dfrac{\partial z}{\partial v} =$ [ ]

If

$$z = (x + y)\,e^{y}, \quad x = u^2 + v^2, \quad y = u^2 - v^2,$$

find the following partial derivatives using the chain rule. Enter your answers as functions of u and v.

$\dfrac{\partial z}{\partial u} =$ $4ue^{u^2-v^2} + 4u^3e^{u^2-v^2}$

$\dfrac{\partial z}{\partial v} =$ $-4u^2ve^{u^2-v^2}$

Let

$$f(x,y,z) = xy^4 + z, \quad x = s^3 t, \quad y = s^2 t^2, \quad z = st.$$

(a) Calculate the primary derivatives

$\dfrac{\partial f}{\partial x} =$ ☐

$\dfrac{\partial f}{\partial y} =$ ☐

$\dfrac{\partial f}{\partial z} =$ ☐

(b) Calculate

$\dfrac{\partial x}{\partial s} =$ ☐

$\dfrac{\partial y}{\partial s} =$ ☐

$\dfrac{\partial z}{\partial s} =$ ☐

(c) Use the Chain Rule to compute

$\dfrac{\partial f}{\partial s} =$ ☐

In (c) express your answer in terms of the independent variables t, s.

Let

$$f(x,y,z) = xy^4 + z, \quad x = s^3t, \quad y = s^2t^2, \quad z = st.$$

(a) Calculate the primary derivatives

$\dfrac{\partial f}{\partial x} =$ $\boxed{y^4}$

$\dfrac{\partial f}{\partial y} =$ $\boxed{4xy^3}$

$\dfrac{\partial f}{\partial z} =$ $\boxed{1}$

(b) Calculate

$\dfrac{\partial x}{\partial s} =$ $\boxed{3s^2t}$

$\dfrac{\partial y}{\partial s} =$ $\boxed{2st^2}$

$\dfrac{\partial z}{\partial s} =$ $\boxed{t}$

(c) Use the Chain Rule to compute

$\dfrac{\partial f}{\partial s} =$ $\boxed{11s^{10}t^9 + t}$

In (c) express your answer in terms of the independent variables t, s.

The function

$$f(x, y) = xy(1 - 8x - 9y)$$

has 4 critical points. List them and select the type of critical point. Points should be entered as ordered pairs and listed in increasing lexicographic order. By that we mean that (x, y) comes before (z, w) if $x < z$ or if $x = z$ and $y < w$.

First point [ ] of type [?]

Second point [ ] of type [?]

Third point [ ] of type [?]

Fourth point [ ] of type [?]

The function

$$f(x,y) = xy(1 - 8x - 9y)$$

has 4 critical points. List them and select the type of critical point. Points should be entered as ordered pairs and listed in increasing lexicographic order. By that we mean that (x, y) comes before (z, w) if $x < z$ or if $x = z$ and $y < w$.

First point $(0, 0)$ of type Saddle

Second point $(0, 1/9)$ of type Saddle

Third point $(1/24, 1/27)$ of type Maximum

Fourth point $(1/8, 0)$ of type Saddle

Find A and B so that $f(x,y) = x^2 + Ay + y^2 + B$ has a local minimum at the point $(0,8)$, with z-coordinate 45.

$A =$ [ ]

$B =$ [ ]

Find A and B so that $f(x,y) = x^2 + Ay + y^2 + B$ has a local minimum at the point $(0,8)$, with z-coordinate 45.

$A =$ -16

$B =$ 109

Consider the function

$$f(x, y) = e^{-9x}\cos(-3y).$$

Find and classify all critical points of the function. If there are more blanks than critical points, leave the remaining entries blank.

$f_x =$ [ ]

$f_y =$ [ ]

$f_{xx} =$ [ ]

$f_{xy} =$ [ ]

$f_{yy} =$ [ ]

The critical point with the smallest x-coordinate is [ ]

Classification: [?]

The critical point with the next smallest x-coordinate is [ ]

Classification: [?]

The critical point with the next smallest x-coordinate is [ ]

Classification: [?]

Consider the function

$$f(x,y) = e^{-9x}\cos(-3y).$$

Find and classify all critical points of the function. If there are more blanks than critical points, leave the remaining entries blank.

$f_x =$ $-9e^{-9x}\cos(3y)$

$f_y =$ $-3e^{-9x}\sin(3y)$

$f_{xx} =$ $81e^{-9x}\cos(3y)$

$f_{xy} =$ $27e^{-9x}\sin(3y)$

$f_{yy} =$ $-9e^{-9x}\cos(3y)$

The critical point with the smallest x-coordinate is ____

Classification: ____

The critical point with the next smallest x-coordinate is ____

Classification: ____

The critical point with the next smallest x-coordinate is ____

Classification: ____

Suppose $f(x, y) = x^2 + y^2 - 8x - 8y + 1$.

(A) How many critical points does f have in $\mathbb{R}^2$?

(B) If there is a local minimum, what is the value of the discriminant D at that point? If there is none, type N.

(C) If there is a local maximum, what is the value of the discriminant D at that point? If there is none, type N.

(D) If there is a saddle point, what is the value of the discriminant D at that point? If there is none, type N.

(E) What is the maximum value of f on $\mathbf{R}^2$? If there is none, type N.

(F) What is the minimum value of f on $\mathbf{R}^2$? If there is none, type N.

Suppose $f(x, y) = x^2 + y^2 - 8x - 8y + 1$.

(A) How many critical points does f have in $\mathbb{R}^2$?

1

(B) If there is a local minimum, what is the value of the discriminant D at that point? If there is none, type N.

4

(C) If there is a local maximum, what is the value of the discriminant D at that point? If there is none, type N.

N

(D) If there is a saddle point, what is the value of the discriminant D at that point? If there is none, type N.

N

(E) What is the maximum value of f on $\mathbf{R}^2$? If there is none, type N.

N

(F) What is the minimum value of f on $\mathbf{R^2}$? If there is none, type N.

-31

Consider the function $f(x, y) = x^2y + y^3 - 48y$.

f has [?] at $(0, -4)$.

f has [?] at $(0, 4)$.

f has [?] at $\left(-4\sqrt{3}, 0\right)$.

f has [?] at $(0, 0)$.

f has [?] at $\left(4\sqrt{3}, 0\right)$.

Consider the function $f(x,y) = x^2y + y^3 - 48y$.

f has [a maximum] at $(0, -4)$.

f has [a minimum] at $(0, 4)$.

f has [a saddle] at $\left(-4\sqrt{3}, 0\right)$.

f has [no critical point] at $(0, 0)$.

f has [a saddle] at $\left(4\sqrt{3}, 0\right)$.

Find the maximum and minimum values of the function $f(x,y) = 2x^2 + 3y^2 - 4x - 5$ on the domain $x^2 + y^2 \leq 289$.

The maximum value of $f(x,y)$ is: [ ]

List the point(s) where the function attains its maximum as an ordered pair, such as $(-6,3)$, or a list of ordered pairs if there is more than one point, such as $(1,3)$, $(-4,7)$.

[ ]

The minimum value of $f(x,y)$ is: [ ]

List points where the function attains its minimum as an ordered pair, such as $(-6,3)$, or a list of ordered pairs if there is more than one point, such as $(1,3)$, $(-4,7)$.

[ ]

Find the maximum and minimum values of the function $f(x, y) = 2x^2 + 3y^2 - 4x - 5$ on the domain $x^2 + y^2 \leq 289$.

The maximum value of $f(x, y)$ is: 866

List the point(s) where the function attains its maximum as an ordered pair, such as $(-6, 3)$, or a list of ordered pairs if there is more than one point, such as $(1, 3)$, $(-4, 7)$.

$(-2, -\sqrt{285}), (-2, \sqrt{285})$

The minimum value of $f(x, y)$ is: -7

List points where the function attains its minimum as an ordered pair, such as $(-6, 3)$, or a list of ordered pairs if there is more than one point, such as $(1, 3)$, $(-4, 7)$.

$(1, 0)$

Find the maximum and minimum values of $f(x, y) = xy$ on the ellipse $4x^2 + y^2 = 7$.

maximum value = [ ]

minimum value = [ ]

Find the maximum and minimum values of $f(x, y) = xy$ on the ellipse $4x^2 + y^2 = 7$.

maximum value = $7/4$

minimum value = $-7/4$

Use Lagrange multipliers to find the maximum and minimum values of $f(x, y) = 2x - y$ subject to the constraint $x^2 + 2y^2 = 18$, if such values exist.

maximum = [ ]

minimum = [ ]

For either value, enter DNE if there is no such value.

Use Lagrange multipliers to find the maximum and minimum values of $f(x, y) = 2x - y$ subject to the constraint $x^2 + 2y^2 = 18$, if such values exist.

maximum = 9

minimum = -9

For either value, enter DNE if there is no such value.

Use Lagrange multipliers to find the point (a, b) on the graph of $y = e^{2x}$, where the value ab is as small as possible.

$P =$ [ ]

Use Lagrange multipliers to find the point (a, b) on the graph of $y = e^{2x}$, where the value ab is as small as possible.

$P =$ $\boxed{(-1/2, 1/e)}$

Evaluate the iterated integral

$$\int_0^4 \int_0^2 12x^2y^3 \, dxdy$$

[ ]

Evaluate the iterated integral

$$\int_0^4 \int_0^2 12x^2y^3 \, dx dy$$

2048

For the integral

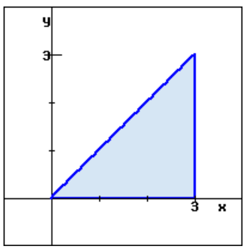
$$\int_0^3 \int_0^x e^{x^2}\, dy\, dx,$$

sketch the region of integration and evaluate the integral. Your sketch should be approximately the same as one of the graphs shown below; which is the correct region?

Graph [?]

Then $\int_0^3 \int_0^x e^{x^2}\, dy\, dx =$ [ ]

Note: the value of the integral needs to be correct to two decimal places.



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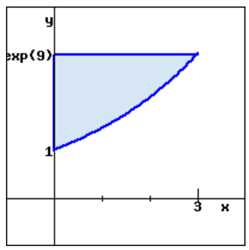

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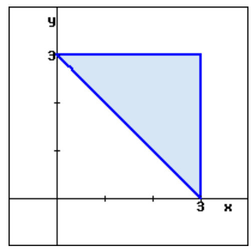

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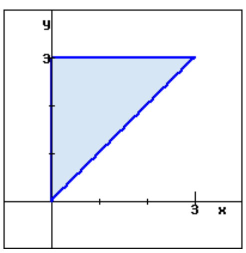

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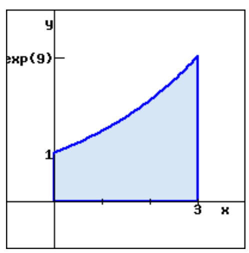

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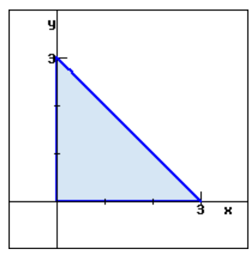


6

For the integral

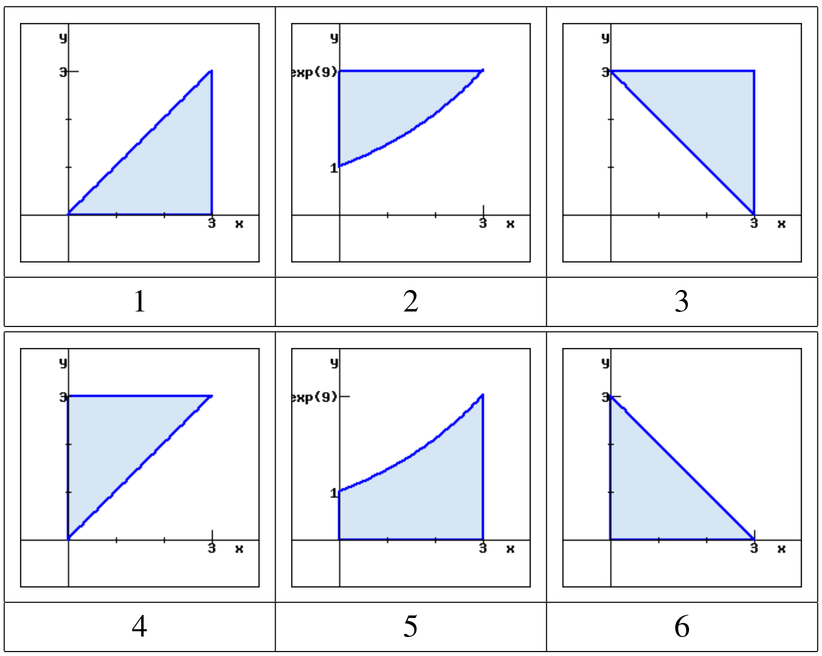
$$\int_0^3 \int_0^x e^{x^2}\, dy\, dx,$$

sketch the region of integration and evaluate the integral. Your sketch should be approximately the same as one of the graphs shown below; which is the correct region?

Graph [1]

Then $\int_0^3 \int_0^x e^{x^2}\, dy\, dx = $ [$(e^9 - 1)/2$]

Note: the value of the integral needs to be correct to two decimal places.



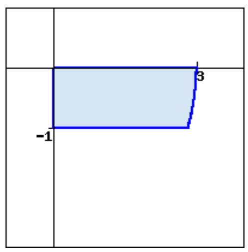
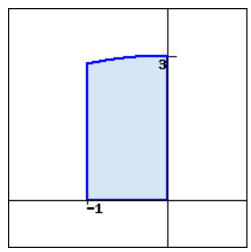
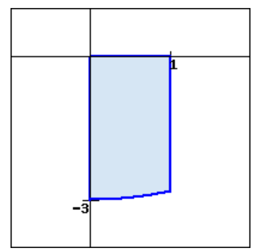
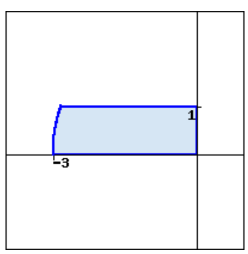
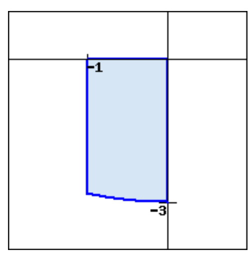
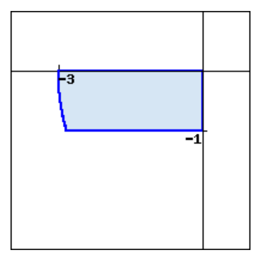
For the integral

$$\int_{-1}^{0}\int_{-\sqrt{9-x^2}}^{0} xy\,dy\,dx,$$

sketch the region of integration and evaluate the integral. Your sketch should be approximately the same as one of the graphs shown below; which is the correct region?

Graph [?]

Then $\int_{-1}^{0}\int_{-\sqrt{9-x^2}}^{0} xy\,dy\,dx =$ [ ]

		
1	2	3
		
4	5	6

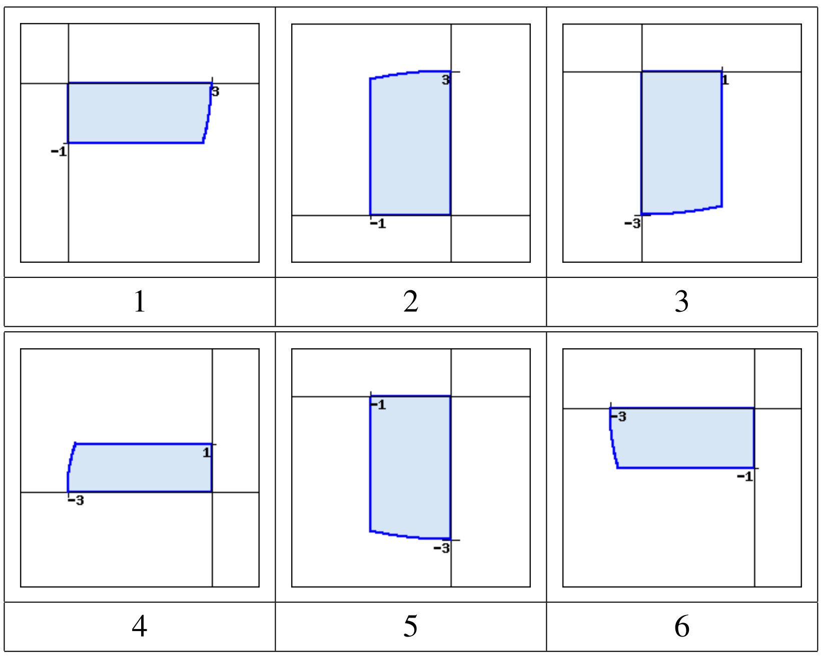
For the integral

$$\int_{-1}^{0}\int_{-\sqrt{9-x^2}}^{0} xy\,dy\,dx,$$

sketch the region of integration and evaluate the integral. Your sketch should be approximately the same as one of the graphs shown below; which is the correct region?

Graph 5

Then $\int_{-1}^{0}\int_{-\sqrt{9-x^2}}^{0} xy\,dy\,dx =$ 17/8



Consider the following integral.

$$\int_0^1 \int_{e^y}^{e} \frac{x}{\ln(x)}\, dx\, dy.$$

Sketch its region of integration in the xy-plane.

(a) Which graph shows the region of integration in the xy-plane? [?]

(b) Write the integral with the order of integration reversed:

$$\int_0^1 \int_{e^y}^{e} \frac{x}{\ln(x)}\, dx\, dy = \int_A^B \int_C^D \frac{x}{\ln(x)}\, dy\, dx$$

with limits of integration

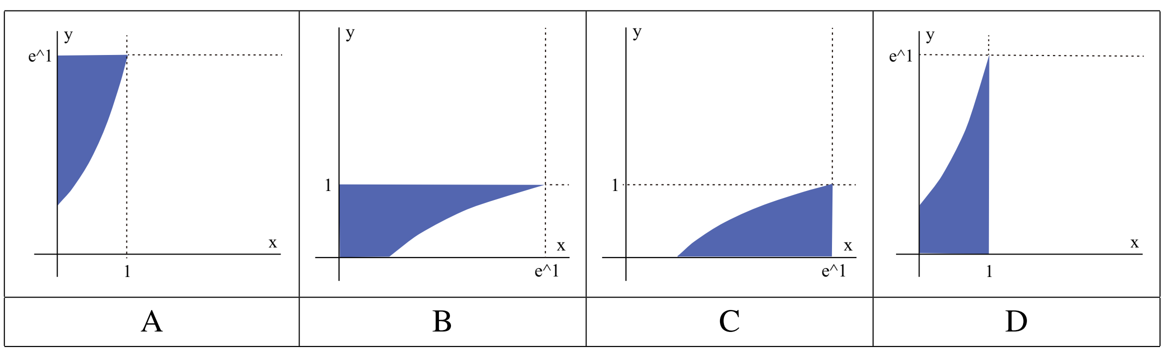
$A =$ [ ]

$B =$ [ ]

$C =$ [ ]

$D =$ [ ]

(c) Evaluate the integral. [ ]



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with limits of integration

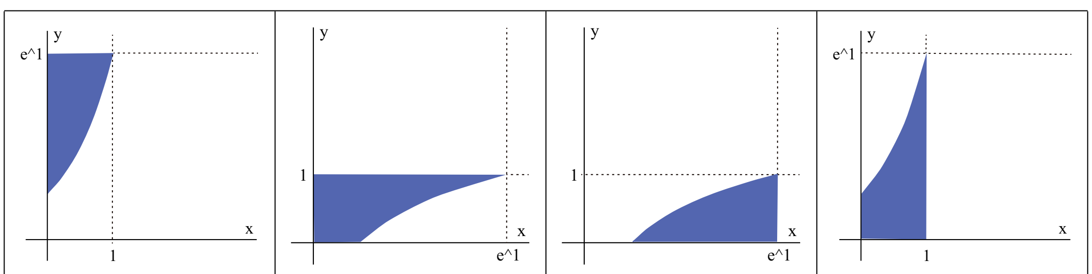
$A =$ 1

$B =$ e

$C =$ 0

$D =$ $\ln(x)$

(c) Evaluate the integral. $(e^2 - 1)/2$



A	B	C	D

Find positive numbers a and b so that the change of variables $s = ax$, $t = by$ transforms the integral

$$\iint_R dx\,dy$$

into

$$\iint_T \left|\frac{\partial(x,y)}{\partial(s,t)}\right| ds\,dt$$

for the region R, the rectangle $0 \le x \le 15$, $0 \le y \le 10$ and the region T, the square $0 \le s,t \le 1$.

$a =$ ______

$b =$ ______

What is $\left|\frac{\partial(x,y)}{\partial(s,t)}\right|$ in this case?

$\left|\frac{\partial(x,y)}{\partial(s,t)}\right| =$ ______

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$a =$ 1/15

$b =$ 1/10

What is $\left|\frac{\partial(x,y)}{\partial(s,t)}\right|$ in this case?

$\left|\frac{\partial(x,y)}{\partial(s,t)}\right| =$ 150

Find a number a so that the change of variables $s = x + ay$, $t = y$ transforms the integral

$$\iint_R dx\,dy$$

over the parallelogram R in the xy-plane with vertices $(0,0)$, $(26,0)$, $(-30,11)$, $(-4,11)$ into an integral

$$\iint_T \left|\frac{\partial(x,y)}{\partial(s,t)}\right| ds\,dt$$

over a rectangle T in the st-plane.

$a =$ [ ]

What is $\left|\frac{\partial(x,y)}{\partial(s,t)}\right|$ in this case?

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over a rectangle T in the st-plane.

$a =$ 30/11

What is $\left|\frac{\partial(x,y)}{\partial(s,t)}\right|$ in this case?

$\left|\frac{\partial(x,y)}{\partial(s,t)}\right| =$ 1

Suppose that

$$\iint_D f(x,y)\,dA = 4,$$

where D is the disk $x^2 + y^2 \leq 16$. Now suppose E is the disk $x^2 + y^2 \leq 64$ and $g(x,y) = 4f(x/2, y/2)$. What is the value of $\displaystyle\iint_E g(x,y)\,dA$?

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64

Suppose R is the shaded region in the figure. As an iterated integral in polar coordinates,

$$\iint_R f(x,y)\,dA = \int_A^B \int_C^D f(r\cos\theta, r\sin\theta)\,r\,dr\,d\theta$$

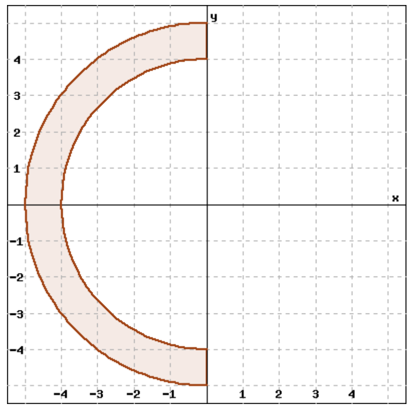
with limits of integration

$A =$ [ ]

$B =$ [ ]

$C =$ [ ]

$D =$ [ ]



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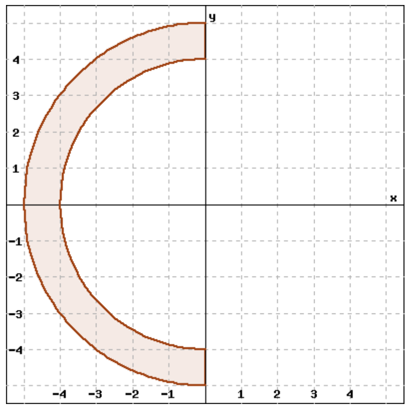
with limits of integration

$A =$ $\pi/2$

$B =$ $3\pi/2$

$C =$ 4

$D =$ 5



Using polar coordinates, evaluate the integral

$$\iint_R \sin(x^2 + y^2)\, dA,$$

where R is the region $9 \leq x^2 + y^2 \leq 36$.

[ ]

Using polar coordinates, evaluate the integral

$$\iint_R \sin(x^2 + y^2)\, dA,$$

where R is the region $9 \leq x^2 + y^2 \leq 36$.

$-\pi\cos(36) + \pi\cos(9)$

Evaluate the integral

$$\iint_R (x^2 - 2y^2)\, dA,$$

where R is the first quadrant region between the circles of radius 3 and radius 4.

$$\iint_R (x^2 - 2y^2)\, dA = \boxed{}$$

Evaluate the integral

$$\iint_R (x^2 - 2y^2)\, dA,$$

where R is the first quadrant region between the circles of radius 3 and radius 4.

$$\iint_R (x^2 - 2y^2)\, dA = \boxed{-175\pi/16}$$

A. Using polar coordinates, evaluate the improper integral

$$\iint_{R^2} e^{-9(x^2+y^2)}\, dx\, dy.$$

B. Use part A to evaluate the improper integral

$$\int_{-\infty}^{\infty} e^{-9x^2}\, dx.$$

A. Using polar coordinates, evaluate the improper integral

$$\iint_{R^2} e^{-9(x^2+y^2)}\, dx\, dy.$$

$\pi/9$

B. Use part A to evaluate the improper integral

$$\int_{-\infty}^{\infty} e^{-9x^2}\, dx.$$

$\sqrt{\pi}/3$

Evaluate

$$\iiint_{\mathcal{W}} f(x,y,z)\,dV$$

for the function f and region $\mathcal{W}$ specified:

$$f(x,y,z) = 24(x+y), \qquad \mathcal{W} : y \le z \le x, \quad 0 \le y \le x, \quad 0 \le x \le 1.$$

$\iiint_{\mathcal{W}} 24(x+y)\,dV =$ ______

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$\iiint_{\mathcal{W}} 24(x+y)\,dV =$ 4

Use spherical coordinates to evaluate the triple integral

$$\iiint_E x^2 + y^2 + z^2 \, dV,$$

where E is the ball: $x^2 + y^2 + z^2 \leq 16$.

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where E is the ball: $x^2 + y^2 + z^2 \leq 16$.

$4^6\pi/5$

Use cylindrical coordinates to evaluate the triple integral

$$\iiint_E \sqrt{x^2+y^2}\, dV,$$

where E is the solid bounded by the circular paraboloid $z = 9 - 4\left(x^2+y^2\right)$ and the xy-plane.

Use cylindrical coordinates to evaluate the triple integral

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$81\pi/10$

Find the volume of the solid that lies within the sphere $x^2 + y^2 + z^2 = 36$, above the xy-plane, and outside the cone $z = 4\sqrt{x^2 + y^2}$.

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$\boxed{576\pi/\sqrt{17}}$