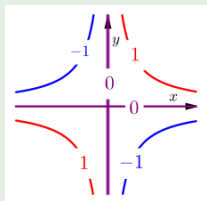


Mathematics II - Summary

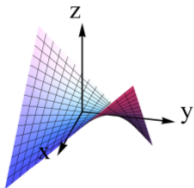
21/22

Exercise

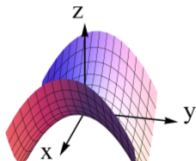
Find the graph for the contourlines



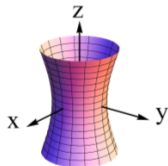
A.



B.

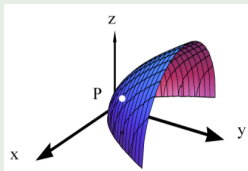


C.



<http://www.cpp.edu/~conceptests/question-library/mat214.shtml>

Exercise



- A $\frac{\partial f}{\partial x} > 0, \frac{\partial f}{\partial y} > 0$
- B $\frac{\partial f}{\partial x} < 0, \frac{\partial f}{\partial y} > 0$
- C $\frac{\partial f}{\partial x} > 0, \frac{\partial f}{\partial y} < 0$
- D $\frac{\partial f}{\partial x} < 0, \frac{\partial f}{\partial y} < 0$

Exercise

Find the tangent plane of a function $f(x, y) = xy$ at the point $(2, 3)$.

A $z - 6 = x(x - 2) + y(y - 3)$

B $z - 6 = y(x - 2) + x(y - 3)$

C $z - 6 = 2(x - 2) + 3(y - 3)$

D $z - 6 = 3(x - 2) + 2(y - 3)$

Exercise

Let $h(u, v) = xy$, where $x = u \cos v$ and $y = u \sin v$. Then for $\partial h / \partial v$ we have

A $\frac{\partial h}{\partial v} = 0$

B $\frac{\partial h}{\partial v} = u^2 \cos(2v)$

C $\frac{\partial h}{\partial v} = -u^3 \sin^2 v \cos v + u^3 \sin v \cos^2 v$

D Something else.

Exercise

The bicyclist is on a trip up the hill, which can be described as $f(x, y) = 25 - 2x^2 - 4y^2$. When she is at the point $[1, 1, 19]$, it starts to rain, so she decides to go down the hill as steeply as possible (so that she is down quickly). In what direction will she start her decline?

A $(-4x; -8y)$

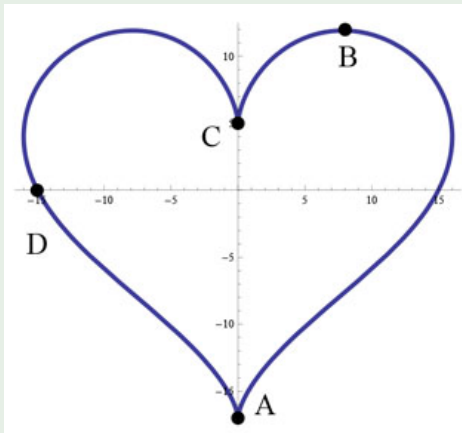
C $(-4; -8)$

B $(4x; 8y)$

D $(4; 8)$

Exercise

Where is the minimum and maximum of the function $f(x, y) = y$ along the

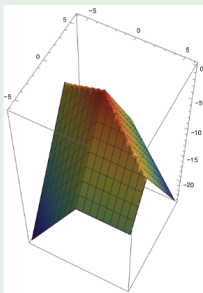
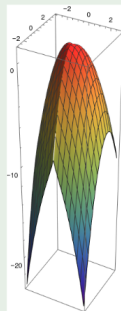
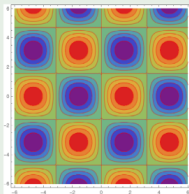
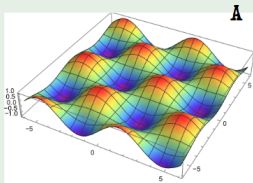


curve?

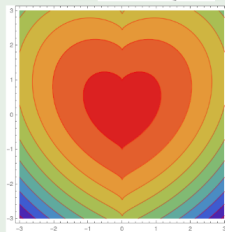
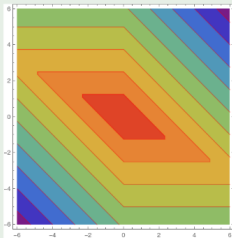
<https://www.cpp.edu/conceptests/question-library/mat214.shtml>

Exercise

Find quasiconcave functions:



B



Exercise

Find \mathbf{AB} , if

$$\mathbf{A} = \begin{pmatrix} 2 & 1 \\ 3 & 2 \end{pmatrix}$$

$$\mathbf{B} = \begin{pmatrix} 4 \\ -1 \end{pmatrix}$$

A $\begin{pmatrix} 5 \\ 2 \end{pmatrix}$

B $\begin{pmatrix} 10 & 7 \end{pmatrix}$

C $\begin{pmatrix} 8 & 4 \\ -3 & -2 \end{pmatrix}$

D $\begin{pmatrix} 7 \\ 10 \end{pmatrix}$

E \mathbf{AB} is not well defined

Exercise

Let **A** and **B** are matrices of the type 2×3 . Which of these operations are NOT well defined?

A $\mathbf{A} + \mathbf{B}$

B $\mathbf{A}^T \mathbf{B}$

C \mathbf{BA}

D \mathbf{AB}^T

E \mathbf{AB}

Exercise

Let

$$\mathbf{A} = \begin{pmatrix} 0 & 4 \\ 2 & 0 \end{pmatrix}$$

Find \mathbf{A}^{-1}

A

$$\begin{pmatrix} 0 & 4 \\ 2 & 0 \end{pmatrix}$$

C

$$\begin{pmatrix} 0 & 1/4 \\ 1/2 & 0 \end{pmatrix}$$

B

$$\begin{pmatrix} 4 & 0 \\ 0 & 2 \end{pmatrix}$$

D

$$\begin{pmatrix} 0 & 1/2 \\ 1/4 & 0 \end{pmatrix}$$

Exercise

We have

$$\det \begin{pmatrix} -2 & 1 & 3 \\ 2 & 0 & 4 \\ 1 & 3 & 1 \end{pmatrix} = 44.$$

Find

$$\det \begin{pmatrix} -2 & 1 & 3 \\ 0 & 1 & 7 \\ 1 & 3 & 1 \end{pmatrix} ?$$

A 44

B -44

C 88

D something else

Exercise

Let $\det \mathbf{A} = 3$. Find $\det \mathbf{A}^{-1}$.

A $1/3$

B 3

C 9

D hard to say.

Exercise

Describe the set of all linear combinations of vectors $(1, 2, 0)$ and $(-1, 1, 0)$?

A point

B line

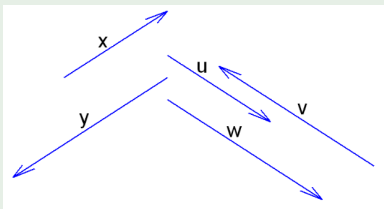
C vector

D plane

E space

Exercise

We made a matrix from the vectors x , y , u , v and w . Find rank of this matrix.



<http://mathquest.carroll.edu/libraries/FHMW.student.edition.pdf>

- A 1
- B 2
- C 3
- D 4
- E 5

Exercise

Which of this matrices can NOT be negative semidefinite?

A

$$\begin{pmatrix} 5 & 1 & -4 \\ 3 & 9 & 4 \\ 1 & 2 & -5 \end{pmatrix}$$

B

$$\begin{pmatrix} -1 & 0 & 8 \\ 3 & -2 & 1 \\ 1 & 0 & -2 \end{pmatrix}$$

C

$$\begin{pmatrix} -1 & 2 & 4 \\ -3 & 0 & 3 \\ -11 & 6 & -5 \end{pmatrix}$$

Exercise

Find $\int x \sin x$.

A $F = \sin x + x \cos x$

B $F = \sin x - x \cos x$

C $F = x \sin x + \cos x$

Exercise

Which of the following functions definitely have primitive function?

A $\frac{1}{x}, x \in \mathbb{R}$

C $\ln x, x \in (0, \infty)$

E $\cot x, x \in (0, \pi)$

B $\arctan x^2, x \in \mathbb{R}$

D $\frac{x^2}{x^3+1}, x \in \mathbb{R}$

Exercise

By parts or by substitution?

A $\int \arcsin x \, dx$

B $\int \frac{x}{1+x^2} \, dx$

C $\int (x^2 - 3) \ln x \, dx$

D $\int \frac{1}{x \ln x} \, dx$

E $\int x^2 \cos 2x \, dx$

Exercise

Find the multiplicity of $\lambda = -2$ of the polynomial

$$P(x) = (x^2 + x - 2)(x + 2)^3.$$

A -2

B 1

C 2

D 3

E 4

Exercise (True – False)

A Let f be a function. Then $\int_0^2 f(x) \, dx \leq \int_0^3 f(x) \, dx$.

B If $\int_2^6 g(x) \, dx \leq \int_2^6 f(x) \, dx$, then $g(x) \leq f(x)$ for all $2 \leq x \leq 6$.

Exercise

Let f be an odd function such that $\int_{-2}^0 f(x) dx = 4$. Find

1. $\int_0^2 f(x) dx$
2. $\int_{-2}^2 f(x) dx$

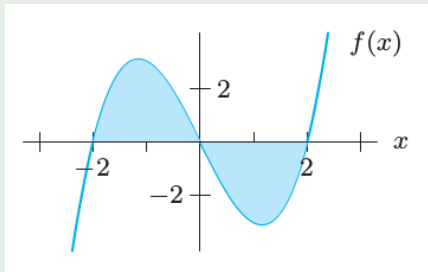


Figure: Applied Calculus, 6th Edition, Deborah Hughes-Hallett and col.

Exercise

Decide, if the integrals are

A $\int_{-\pi}^0 \sin x \, dx$

B $\int_0^{\pi} \cos x \, dx$

C $\int_{-\pi}^{\pi} \sin x \, dx$

D $\int_{-\pi/2}^{\pi/2} \cos x \, dx$

E $\int_0^{2\pi} e^{-x} \sin x \, dx$

1. positive

2. 0

3. negative



Figure: <https://www.meme-arsenal.com/en/create/template/805594>