Creativity in e-learning

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Content

- Three case studies:
- Mathematics for ICT
  - undergraduate -1st year
  - Taxonomies
- Discrete mathematics with graph theory
  - 3rd year
- Project cycles in reasearch and development
  - postgraduate PhD study
- Students' evaluations
- Conclusion Q&A

Enhance professional & generic skills

"Student should strive to acquire self-direction and creativity, critical thinking and problem-solving skills, collaborative team work and communication skills."

([6], p. 16)

Source: [6] Open Educational Practices and Resources, OLCOS Roadmap 2012 (2007), edited by G. Geser. Available at: www.olcos.org

Respect diversity of student population

- Motivation
- Learning styles
- Background – prior knowledge
- Underrepresented groups

- At the beginning of a course – tests for motivation and learning styles
  - Infromation for a teacher and students

Blended learning approach

Characteristics	***Mathematics***	***Discrete math***	***PM in R&D***
Student population	1st year underg.	3rd year underg.	PhD
Group size	Big groups	Medium size	Small
Learning outcomes	Professional skills	Professional and generic skills	Generic and professional skills
Material vs Interaction	Material	Material Interaction	Interaction Material
Taxonomy	Cox MATH-KIT	Cox & Bloom	Bloom
Assessment on-line	20%	40%	60%
Tools	LMS (Moodle, guided)	LMS & Social Software	LMS & Social s. & self-paced on-line course

Mathematics for ICT

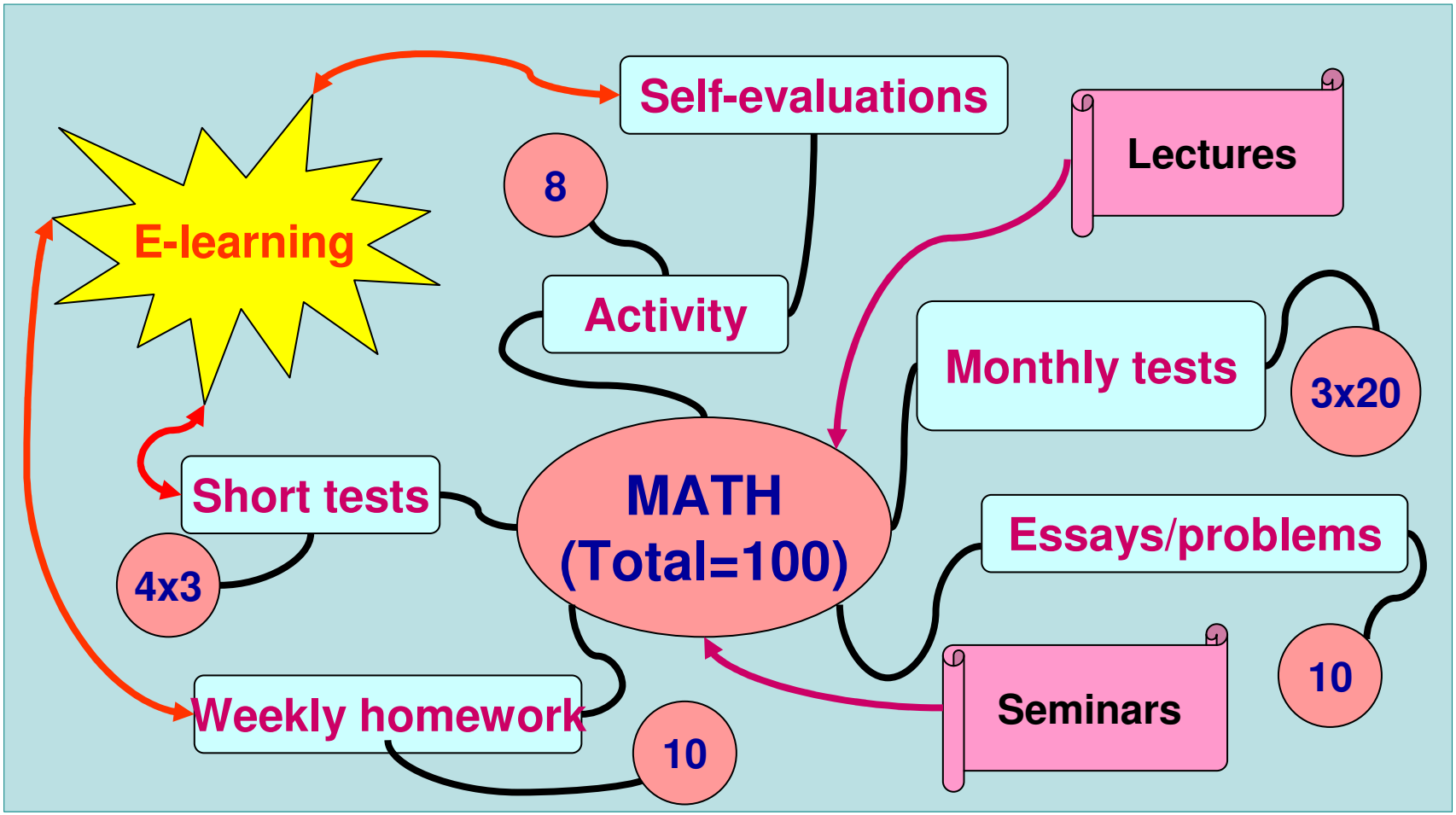
Why do we want to enhance learning of mathematics at FOI?

- The first-year Mathematics courses are often viewed as an obstacle for retention in studying ICT.
- The ICT students are inclined to use technology in teaching and learning process.
- Students have a less positive view on Mathematics than on four other tested subjects. ([11], National exams, 2006)
- Students are better at algebraic questions and underperformed in geometry. ([11], National exams, 2006)

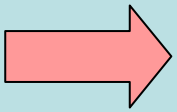
Mathematics for ICT

- The course is taught as a blended (hybrid) course.
- Students' work:
  - Assessed in class
  - Weekly homework assignments (3 out of 13 in VLE Moodle)
  - Written essays
  - Short tests (3 out of 4 in VLE Moodle)
  - Three mid-term tests

Mathematics for ICT– blended learning



Mathematics for ICT

- One dimension of the course – **content** (width).
- Another dimension of the course – the **depth** of the mathematical knowledge and skills  we needed **taxonomy**.

Cox taxonomy – MathKIT (2003)

K	Knowledge/routine skills and techniques (knowledge, remember, recognition, define, identify)
I	Interpretation/insight of these (understand, analysis, distinguish, investigate, prove)
T	Transfer to new context and application (application, evaluation, synthesis/create, design, formulate)

Moodle - **M**odular **O**bject-**O**riented **D**ynamic **L**earning **E**nvironment

- Moodle - a free VLE enabling teachers to create on-line learning material but also initiate and support dialog.

- Inside the Moodle environment we can find:
  - Learning outcomes for each chapter
  - Lectures in form of presentations prepared in beamer (latex type) and smart boards
  - Weekly homework assignments
  - Self-evaluation tests
  - Quizzes
  - Problem solving
  - Chat, forums
  - Glossary
- www.foi.hr/moodle

Aktivnosti

- Forumi
- Resursi
- Rječnici
- Testovi
- Zadaće

Korisnici

- Sudionici

Administracija

- Omogući izmjene
- Postavke
- Promijeni osobne podatke
- Nastavnici
- Studenti
- Grupe
- Backup
- Restore
- Import
- Reports
- Pitanja
- Skale
- Ocjene
- Datoteke
- Pomoć
- Forum predavača

Apleti

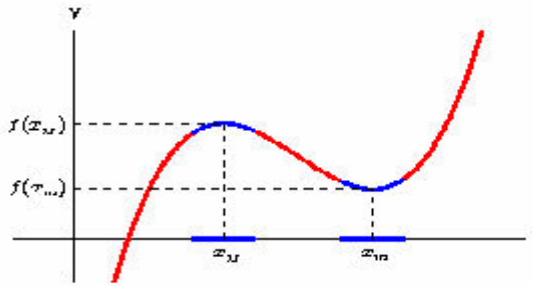
- Eksponencijalna funkcija

Uvod

- Forum s vijestima
- Model praćenja studenata

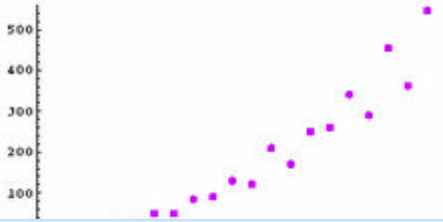
1 *Realne funkcije realne varijable*

- Predavanja
- Rječnik
- Zadaća 3



2 *Nizovi realnih brojeva*

- Predavanja
- Rječnik
- Zadaća 4
- Zadaća 5
- Samoprocjena 1-aktivnost



3 *Limes funkcije*

- Predavanja
- Rječnik
- Zadaća 6

4 *Derivacija funkcije*

- Predavanja
- Rječnik
- Zadaća 7
- Zadaća 8

Najsvježije vijesti

Dodajte novu temu...

18 Svi, 12:19
Mirela Ostroški
Seminari za G21 više...

16 Svi, 18:18
Marija Jakuš
demonstrature više...

2 Svi, 18:30
Marija Jakuš
raspored za kolokvij2 više...

2 Svi, 15:47
Marija Jakuš
kolokvij2 više...

27 Tra, 15:32
Marija Jakuš
Zadaća9 više...

Prošle teme...

Buduća događanja

Kr. provjera 3 (Test se zatvara)
Petak, 25 Svibanj (12:00)
Ponedjeljak, 28 Svibanj (13:05)

DZ 13 (Test počinje)
Nedjelja, 3 Lipanj (13:00)

Kr. provjera 4 (Test se zatvara)
Utorak, 5 Lipanj (13:05)

Prikaži kalendar...
Novi događaj...

Kolokviji

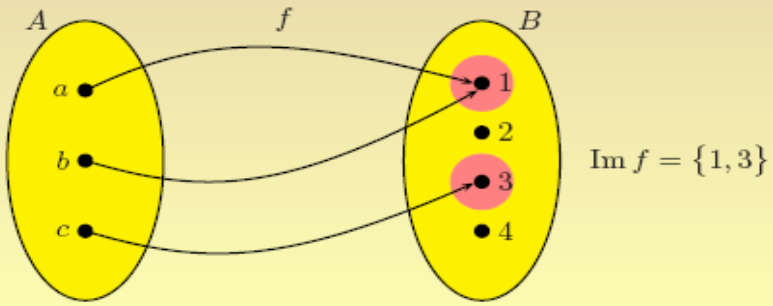
Lectures - presentations

Slika funkcije

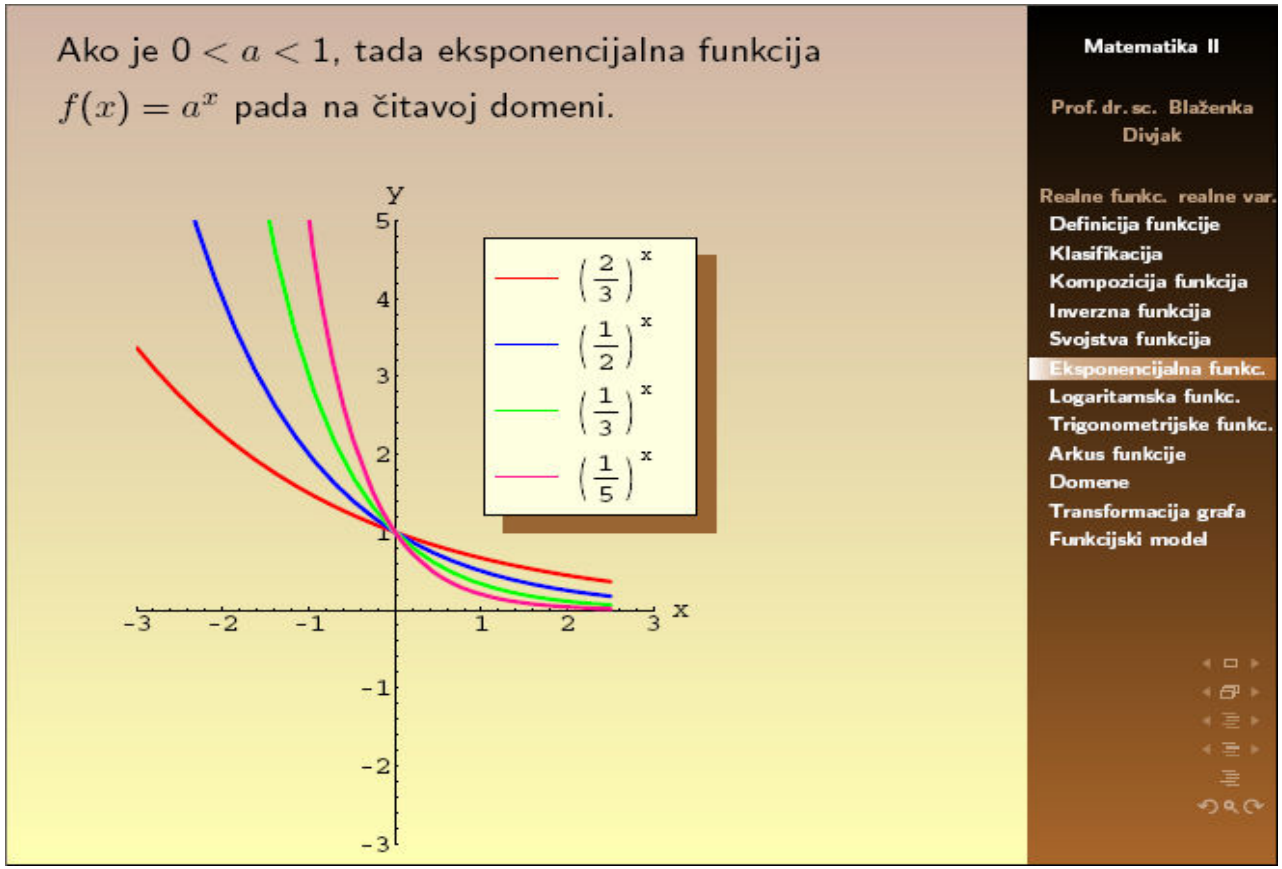
Neka je $f : A \to B$ funkcija. **Slika funkcije** f je skup

$$\operatorname{Im} f = \{f(x) : x \in A\} \subseteq B.$$

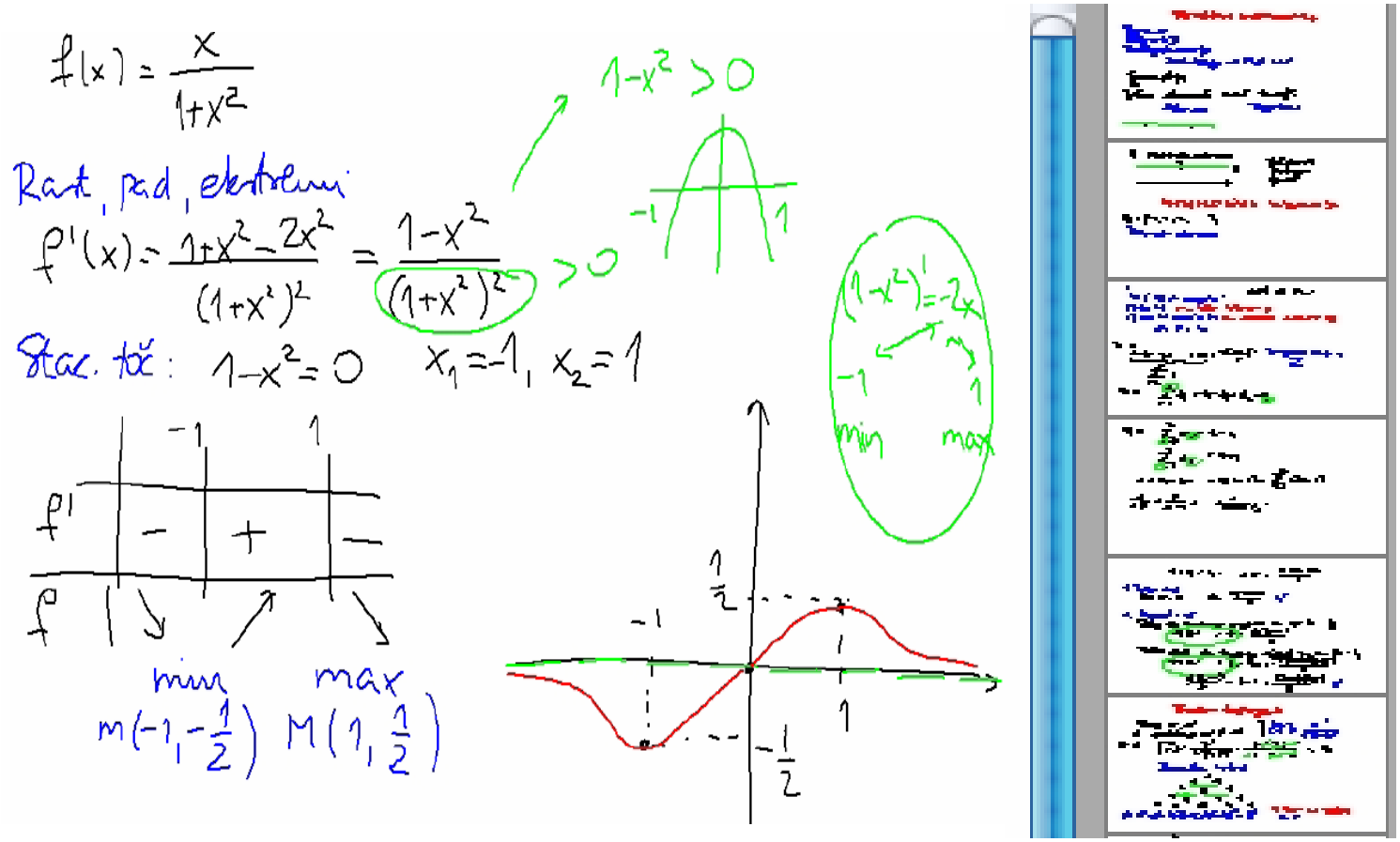
Jednostavno rečeno, slika funkcije f su svi elementi iz kodomene koji su "pogođeni", tj. u koje se netko preslikao iz domene.



Lectures - presentations



Lectures - smart board



Individual homework

1

Marks: --/1

Zadatak18.
Odredite detrminantu:

$$\begin{vmatrix} -10 & 3 \\ 4 & 0 \end{vmatrix}$$

2

Marks: --/1

Zadatak 13.
Odredite determinantu:

$$\begin{vmatrix} -12 & 12 & 17 \\ 16 & -19 & 20 \\ 15 & -16 & 6 \end{vmatrix}$$

a) razvojem po 2. retku,
b) Sarrusovim pravilom.

3

Marks: 0/1

Zadatak 30.
Odredite determinantu:

$$\begin{vmatrix} -1 & 3 & 5 & 5 \\ 0 & 3 & 2 & 8 \\ -5 & 4 & 3 & -5 \\ 0 & 5 & 2 & 4 \end{vmatrix}$$

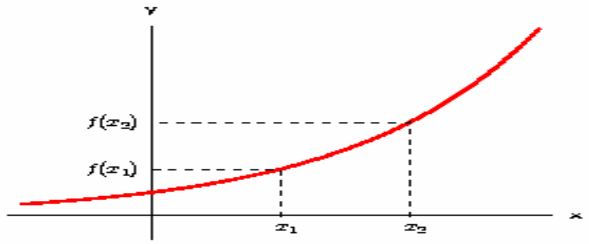
a) razvojem po 1. stupcu,
b) svođenjem na gornje trokutastu matricu.

Test

1

Marks: 1

Kako se zove funkcija čiji je graf prikazan slikom



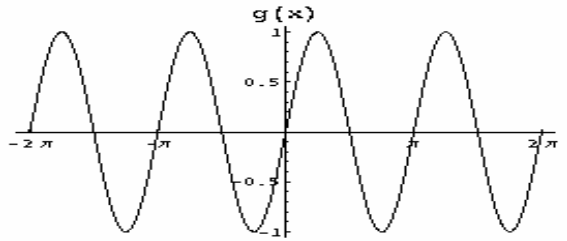
Odaberite jedan odgovor.

- a. eksponencijalna
- b. polinom 1. stupnja
- c. logaritamska
- d. ciklometrijska
- e. polinom 2. stupnja

2

Marks: 1

Funkcija sa slike ima ekstreme u točkama $k\cdot\frac{\pi}{2}$ za cijele brojeve k.



Odgovor:

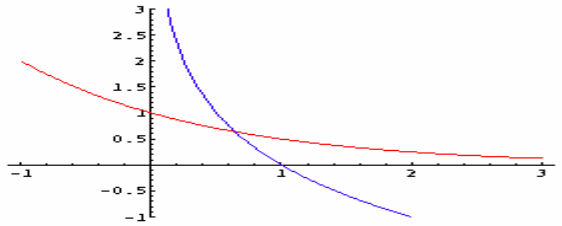
- Točno
- Netočno

Test

3

Marks: 1

Što možete reći o funkcijama f (plava) i g (crvena) sa slike.



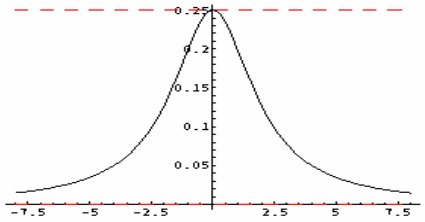
Odaberite jedan odgovor.

- a. f raste, g raste
- b. f pada, g raste
- c. f raste, g pada
- d. f pada, g pada

4

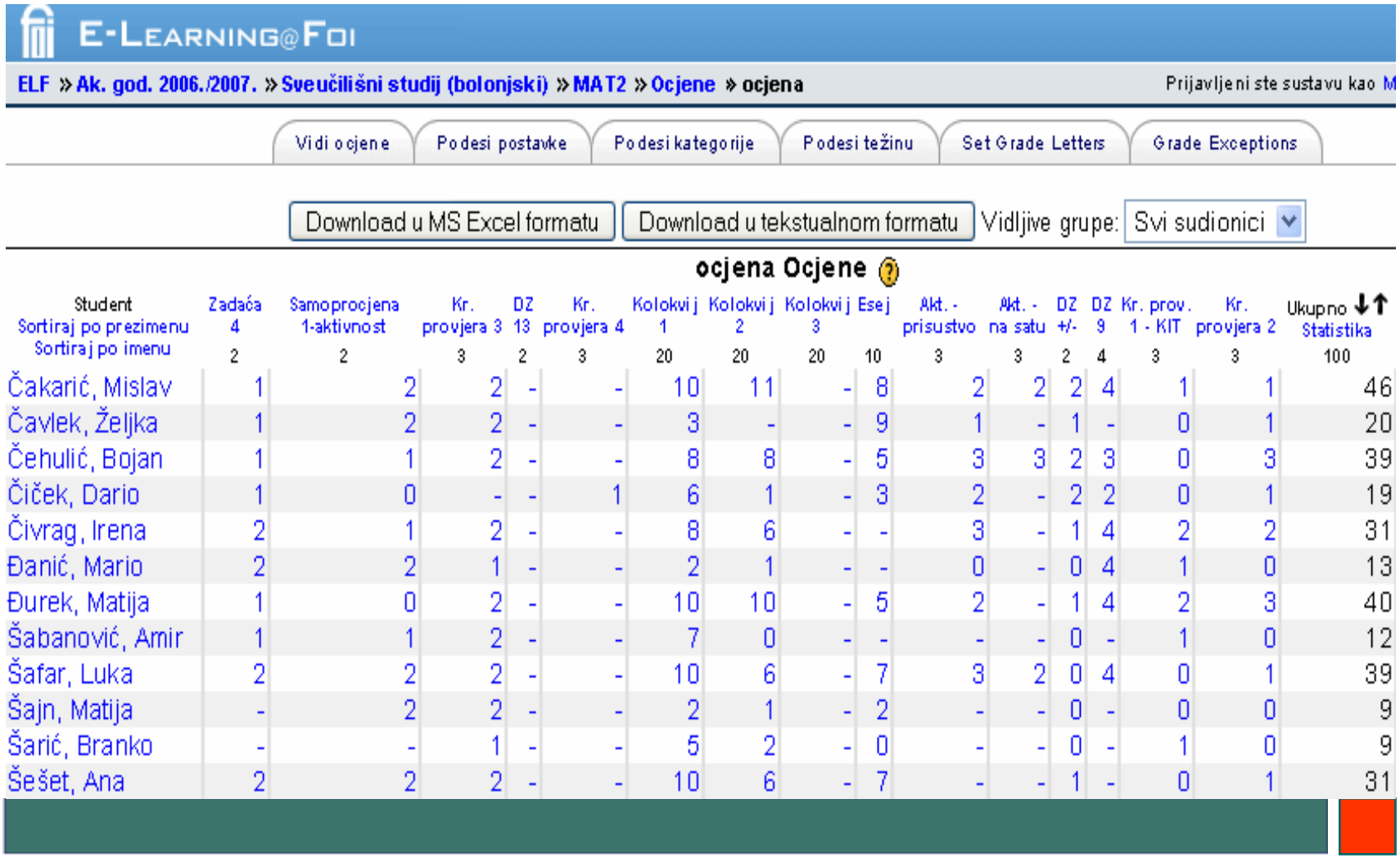
Marks: 1

Za funkciju čiji je graf prikazan slikom, povežite zadane intervale s odgovarajućim svojstvima funkcije.



$\langle 0,\infty\rangle$	interval pada funkcije
$\langle -\infty,0\rangle$	interval rasta funkcije
$\langle 0,0.25]$	kodomena funkcije
skup R	domena funkcije

Monitoring



E-LEARNING@FOI

ELF » Ak. god. 2006./2007. » Sveučilišni studij (bolonjski) » MAT2 » Ocjene » ocjena

Prijavljeni ste sustavu kao M

Vidi ocjene | Podesi postavke | Podesi kategorije | Podesi težinu | Set Grade Letters | Grade Exceptions

Download u MS Excel formatu | Download u tekstualnom formatu | Vidljive grupe: Svi sudionici

ocjena Ocjene

Student Sortiraj po prezimenu Sortiraj po imenu	Zadaća 4 2	Samoprocjena 1-aktivnost 2	Kr. provjera 3 3	DZ 13 2	Kr. provjera 4 3	Kolokvij 1 20	Kolokvij 2 20	Kolokvij 3 20	Esej 10	Akt. - prisustvo 3	Akt. - na satu 3	DZ +/- 2	DZ 9 4	Kr. prov. 1 - KIT 3	Kr. provjera 2 3	Ukupno Statistika 100
Čakarić, Mislav	1	2	2	-	-	10	11	-	8	2	2	2	4	1	1	46
Čavlek, Željka	1	2	2	-	-	3	-	-	9	1	-	1	-	0	1	20
Čehulić, Bojan	1	1	2	-	-	8	8	-	5	3	3	2	3	0	3	39
Čiček, Dario	1	0	-	-	1	6	1	-	3	2	-	2	2	0	1	19
Čivrag, Irena	2	1	2	-	-	8	6	-	-	3	-	1	4	2	2	31
Đanić, Mario	2	2	1	-	-	2	1	-	-	0	-	0	4	1	0	13
Đurek, Matija	1	0	2	-	-	10	10	-	5	2	-	1	4	2	3	40
Šabanović, Amir	1	1	2	-	-	7	0	-	-	-	-	0	-	1	0	12
Šafar, Luka	2	2	2	-	-	10	6	-	7	3	2	0	4	0	1	39
Šajn, Matija	-	2	2	-	-	2	1	-	2	-	-	0	-	0	0	9
Šarić, Branko	-	-	1	-	-	5	2	-	0	-	-	0	-	1	0	9
Šešet, Ana	2	2	2	-	-	10	6	-	7	-	-	1	-	0	1	31

Dictionary

N

NEPARNOST:

Za funkciju f kažemo da je neparna ako vrijedi

$$f(-x) = -f(x), \ \forall x \in D \cdot$$

Graf neparne funkcije simetričan je s obzirom na ishodište.

Npr. Neparne su funkcije: $f(x) = \sin x$ i $f(x) = x^3$.

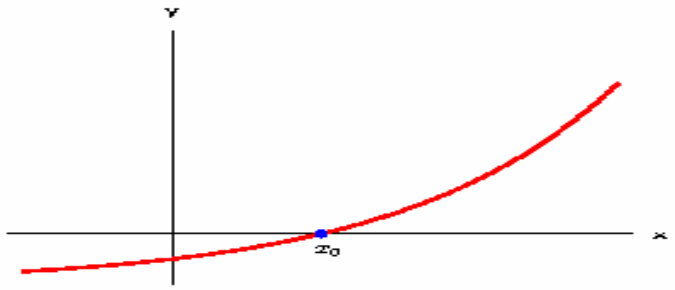
Funkcije još mogu biti i parne ili ni parne ni neparne.

NULTOČKA:

Za realni broj x_0 kažemo da je nultočka funkcije $y=f(x)$ ako je

$$f(x_0)=0.$$

To je broj za koji je vrijednost funkcije jednaka 0, a ujedno i broj na osi x gdje graf funkcije siječe os.



Forum

Opće vijesti i najave

Dodajte novu temu

Diskusija	Započeo	Odgovora	Zadnja poruka
Koji su kolokvirali (prijava ispita)	Damir Horvat	3	Matija Grabar Uto, 23. Sij 2007, 15:07
Rezultati kolokvija	Damir Horvat	0	Damir Horvat Pon, 22. Sij 2007, 13:47
Eseji	Mirela Ostroški	5	Robert Žibreg Sri, 6. Pro 2006, 14:05
Demonstrature	Mirela Ostroški	0	Mirela Ostroški Uto, 24. Lis 2006, 13:01

Koji su kolokvirali (prijava ispita)
napisao/la Damir Horvat - Ponedjeljak, 22. Sije&#x0000;anj 2007, 13:52

Studentice i studenti koji su položili Matematiku 1 preko kolokvija dužni su do petka 26.1.2007. prijaviti ispit preko studomata za rok 30.1.2007. (radi evidencije dobivene ocjene)

Obriši | Odgovori (reply)

Re: Koji su kolokvirali (prijava ispita)
napisao/la Matija Grabar - Ponedjeljak, 22. Sije&#x0000;anj 2007, 18:48

(nastavak na razgovor sa dodjele potpisa)

...
Bilo je rjeci da proteklih godina, studenti koji nisu kolokvirali kroz nastavni proces (osobno mi manjka 3 boda iako imam 51) nemaju pravo na prvi rok.

So.., dali je doslo do zabune, ili se ove godine takodjer tradicija nastavlja..

Prikaži nadređenu poruku | Podijeli | Obriši | Odgovori (reply)

Re: Koji su kolokvirali (prijava ispita)
napisao/la Blaženka Divjak - Utorak, 23. Sije&#x0000;anj 2007, 07:36

Kolega Grabar, i ove godine možete pristupiti svim rokovima, koji su Vam otvoreni, a za koje imate ispunjene uvjete. Važno je da imate potpis, tj. da Vam je otvoren rok u terminu kad su moguće prijave. Konkretno, budući da su potpisi danas, Vi možete pristupiti roku idući tjedan.

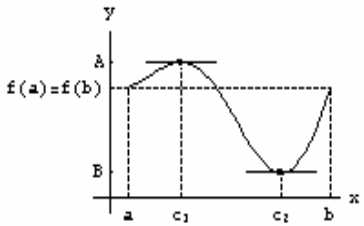
Puno uspjeha.

Evaluation and self-evaluation

- Self-evaluation is test in electronic form in Moodle. Students test their knowledge independently and without presence of teacher. Immediately after submitting the test they get feedback about their success.

- Questions are arranged by Cox taxonomy and generated from data base of questions.

Cox – T (Roll's theorem)

Tekst pitanja	Tekst odgovora	partial credit	R. Counts ↓	R.%	% Correct Facility	SD
T22iF : **Navedenoj slici pridružite odgovarajuće teoreme o srednjoj vrijednosti:**  	Fermat-ov teorem	(0.50)	7/23	(30%)	35 %	0.382
	Roll-ov teorem	(0.50)	13/23	(57%)		
	Cauhy-jev teorem	(-0.50)	7/23	(30%)		
	Lagrange-ov teorem	(-0.50)	5/23	(22%)		

Advantages of using test in Moodle

- Students can estimate their knowledge in short time.
- Immediately, after the submitting test student gets feedback.
- Each student gets his/her own set of questions – Moodle shuffles the questions and answers.
- Questions are arranged by Cox taxonomy – one student cannot get 4 easy questions and another student 4 difficult.
- The test reduces time that is needed for correcting the answers.
- Teacher has simple access to every test.
- Research on pedagogy of mathematics is easier

Results

		Graph/Geom	Algebraic
Math1 - test at the beginning of the first term	K	48.7%	69.5%
	I	24.4%	30%
	T		
Math1 – short test in Moodle	K		64.8%
	I		52.7%
	T		40.6%
Math2 - test at the beginning of the second term	K	83%	76.9%
	I	28.5%	17.7%
	T	41.8%	14.8%
Math2 – short test in Moodle	K	73.9%	
	I	64.3%	
	T	44.3%	

X% - the percentage of students that answer the question correctly

Conclusions for Math

- Students' attitudes towards combining on-line teaching and learning techniques with traditional classroom lectures tended to be positive. Similar results have been found in other studies ([10]).
- The results of the survey and the student pass rate indicate a positive evaluation of the innovative learning strategy in Mathematics regarding student retention in general.
- Geometric and algebraic problems are solved better after the course has been redesigned.
- It is very important to use technology enhanced learning, especially for teaching ICT students which are in general inclined to technology.

Two paradigms for PM in R&D on PhD

1. *Most effective learning is working in real-life situations*

&

2. *Teach them what you promised and students will respond with effort*

Organization of lectures

- to support group work activities
- smaller teaching groups *(up to 25 participants)* - form smaller project groups *(4-5 students)*
- support to the groups is provided from the lecturer and one or two assistants

- a **student-centred learning model** (SCL) and a **virtual learning environment** (VLE) open source *Moodle* to support the model
- SCL model proven to be a very beneficial for students
- 12 students in the doctoral study group in academic year 2006/07 evaluated the teaching and learning methods on the scale from 1 to 5
- *10 answers = mark 5 (excellent) and 2 answers = mark 4 (very good).*

Map of learning outcomes and assessment methods (extract)

Learning outcome	Assessment method
Understanding and application of project management methods for application and management of R&D (research and development) projects	• Oral exam, application presentation and "defence" • Team work on specific methods during and between lectures • Project application writing • Presentation of theoretical and practical aspects of each application section
Synthesis, design and presentation of main components in an international R&D project application and the mastery of required terminology (mostly in English)	• Writing the project application with summary in English • Oral exam, application presentation and "defence" of proposal • Presentation of theoretical and practical aspects of each application section • Construction of on-line course on FP7 project application in *Moodle* • Project evaluation procedure with summary in English
Evaluation of R&D projects in respect to the application of project management methods and, in a reasonably reduced range, in respect to scientific relevance of the proposed research	• Project evaluation procedure based on set rules and regulations

Verification of student workload

- each student keeps a **diary of activities** in the *Moodle* with record of working hours

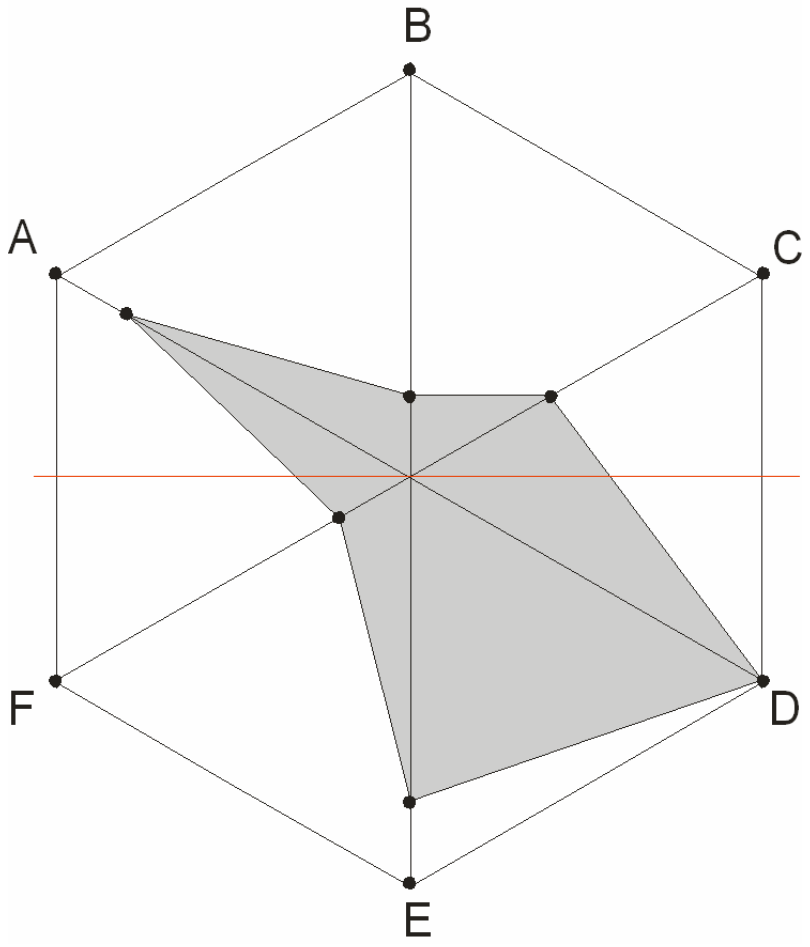
  www.foi.hr/Moodle
- 300-500 words
- follow up on the satisfaction of students - anonymous questionnaires and informal interviews, publication of evaluation results

Evaluation of the *VLE* at the PhD

- **excellent grades** for material distribution
- better **communication between students and teacher**
- positive towards contribution to **collaboration among students**
- the main improvement - **teacher accessibility**!
- **transparency of work** and **achievement of learning outcome**
- Minor problems - not enough pre-experience with ICT (some)

Radar chards: Math – PM in R&D

- Radar chart Math
- **INTERACTION:**
- A: Dynamics and access
- B: Assessment
- C: Communicaton
- **MATERIAL**:
- D: Content
- E: Richness
- F: Independence



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Q &A

Thank you for your attention!

☺ ☺ ☺