Component Area Option (a): Mathematics/Reasoning - MATH - 1314

Restricted Use - AR -UGRD Course - REVISE existing Core Course <or> Revise existing non-core course to ADD to Core

General Information

Please use this form to:

- **REVISE** a course that is already on the Core course list.
- **ADD** to the Core course list an existing permanent course that is not already on the Core course list

Course Ownership

Department* **Department of Mathematics**

Will the course be cross-listed with another area?* ○ Yes ◉ No

If "Yes", please enter the cross-listed course information (Prefix Code Title)

Implementation

Academic Year to begin offering course:* ◉ 2015 ○ 2016 ○ 2017

Term(s) Course will be TYPICALLY Offered:* ☑ Fall (including all sessions within term) ☑ Spring (including Winter Mini all sessions within term ☑ Summer (including Summer Mini and all sessions within term)

Justification for changing course

Justification(s) for Adding Course* **1. REVISE EXISTING non-CORE COURSE ADD TO CORE**

Justification "Other" if selected above:

Importing course information for revising existing Core course

Instructional Area/Course Prefix* MATH

Course Number* 1314

Long Course Title* Calculus for Business and the Life Sciences

Short Course Title

Instruction Type and Student Contact Hours

Instruction Type* **Lecture ONLY**

Contact Hours

Student Contact Hours are determined by a number of factors, including instruction type, and are used to determine the accuracy of credit hours earned by accrediting agencies and THECB. Please contact your college resource for assistance with this information.

Student Contact Hours must match the instruction type.
Eg: If Lecture ONLY, then Student Contact Hours for Lab must be zero.
Eg: If Lab ONLY, then Student Contact Hours for Lecture must be zero.

Lecture* 3

Lab* 0

Grade Options

Grade Option* **Letter (A, B, C.....)**

CIP Code

The CIP Code is used by the university and the THECB to determine funding allocated to the course, which means that selecting the most helpful valid code may have an effect on your course.

If assistance is needed with code selection, please contact your college resource.

CIP Code Directory: http://www.txhighereddata.org/Interactive/CIP/

CIP Code must use this format:
##.####.## ##

Course Repeatability

Can this course be repeated for credit?* ○ Yes ○ No

If Yes, how often and/or under what conditions may the course be repeated?

CIP Code* 27.0101.00 01

Catalog Descriptions

Prerequisite(s):* *Prerequisite:* credit for or placement out of MATH 1310.

Corequisite(s)

Course Description*

Curve sketching and graphical analysis, differentiation and integration of elementary functions, topics in functions of several variables, applications in business and the natural and social sciences.

Course Notes **Note:** Students with prior credit for MATH 1431 will not be permitted to enroll in or receive credit for MATH 1314.

Authorized Degree Program(s)

Impact Report *

Impact Report for Math 1314

Prerequisite:	ECON 3347 - Capital Market Economics
	ECON 4360 - Introduction to Mathematical Economics
	FINA 4334 - Managerial Analysis
	FINA 3332 - Principles of Financial Management
	STAT 3331 - Statistical Analysis for Business Applications I
Note:	MATH 1314 - Calculus for Business and the Life Sciences
TCCN Equivalent	MATH 1310 - College Algebra
Programs	American Cultures Minor
	Architecture, B.Arch.
	Communication, B.A.
	Computer Engineering Technology, B.S.
	Computer Information Systems, B.S.
	Construction Management, B.S.
	Digital Media, B.S.

	Earth Science, B.A.
	Electrical Power Engineering Technology, B.S.
	English, B.A.
	Environmental Design, B.S.
	Finance Minor
	General B.B.A. Requirements
	General NSM Degree Information
	Health, B.S.
	Honors Degree Core Curriculum
	Human Development and Family Studies with Double Major, B.S.
	Human Development and Family Studies with Nonprofit Leadership Alliance Certification, B.S.
	Human Development and Family Studies, B.A.
	Human Development and Family Studies, B.S.
	Human Nutrition and Foods (ACEND Accredited Track), B.S.
	Human Nutrition and Foods (Nutritional Sciences Track), B.S.
	Human Nutrition and Foods, B.A.
	Human Resources Development, B.S.
	II. Mathematics
	Industrial Design, B.S.
	Interior Architecture, B.S.
	Kinesiology, B.S.
	Mechanical Engineering Technology, B.S.
	Music Composition, B.M.
	Music Theory, B.M.
	Organizational Leadership and Supervision, B.S.
	Personal Financial Planning Minor
	Philosophy Minor
	Retailing and Consumer Science, B.S.
	Risk Management and Insurance Minor
	Sample B.B.A. Degree Plan
	Suggested Program - Bachelor of Arts in Earth Science
	Supply Chain and Logistics Technology, B.S.

Core Curriculum Information

For additional guidance when developing course curriculum that will also meet the Core Curriculum requirements, please refer to the Undergraduate Committee website for Core Curriculum:

http://www.uh.edu/undergraduate-committee/doc_2014-core-review.html

Therein you will find a chart for the required and optional competencies based on the Core Component Area (Core Category) selected.

Component Area for which the course is being proposed (select one)*

Component Area Option (a): Mathematics/Reasoning

List the student learning outcomes for the course*

Upon successful completion of this course students will understand the basic ideas of differential and integral calculus and some of their applications to business, the social sciences, and the life sciences. They will have an understanding of the importance in these disciplines of techniques of optimization of functions of one or several variables. They will develop their critical thinking, communication and quantitative skills.

See the attached pdf file for specific Course Objectives. The student will be able to master these objectives at the level of mastery indicated on the syllabus.

Competency areas addressed by the course*

Communication Skills

Critical Thinking

Empirical & Quantitative Skills

Because we will be assessing student learning outcomes across multiple core courses, assessments assigned in your course must include assessments of the core competencies. For each competency selected above, indicated the specific course assignment(s) which, when completed by students, will provide evidence of the competency.

Provide (upload as attachment) detailed information, such as copies of the paper or project assignment, copies of individual test items, etc. A single assignment may be used to provide data for multiple competencies.

Critical Thinking, if applicable

Students will develop critical thinking skills through learning the importance in business, social and life sciences of techniques of optimization of functions of one or several variables. They will learn to translate ordinary language statements of problems into mathematical expression to solve problems. Question 1 on the attached exam is a suitable example.

Communication Skills, if applicable

Upon successful completion of this course students will demonstrate through assignments their ability to translate ordinary language statements of problems into mathematical expression, develop mathematical solutions to such problems and then explain their conclusions through effective communication skills. Question 7 on the attached exam is a suitable example.

Empirical & Quantitative Skills, if applicable

Class assignments will demonstrate students ability to use technology to aid in deriving graphical and numerical solutions of stated problems. The assignments will also demonstrate the students' ability to translate ordinary language statements of problems into mathematical expression and develop mathematical solutions to such problems. Virtually every question on the attached exam would assess these skills.

Teamwork, if applicable

Social Responsibility, if applicable

Personal Responsibility, if

applicable

Syllabus

Syllabus* ✓ Syllabus Attached

Will the syllabus vary across multiple section of the course?* Yes No

If yes, list the assignments that will be constant across sections

Important information regarding Core course effectiveness evaluation:

Inclusion in the core is contingent upon the course being offered and taught at least once every other academic year. Courses will be reviewed for renewal every 5 years.

The department understands that instructors will be expected to provide student work and to participate in university-wide assessments of student work. This could include, but may not be limited to, designing instruments such as rubrics, and scoring work by students in this or other courses. In addition, instructors of core courses may be asked to include brief assessment activities in their course.

Additional Information Regarding This Proposal

Comments:

MATH1314 - Elements of Calculus

Section number: This information applies to ALL face-to-face sections

Delivery format: face-to-face lecture

Prerequisites: Credit for or out of Math 1310. Students with prior credit for Math 1431 will not be permitted to enroll in or receive credit for Math 1314.

Textbook: Available in electronic form (PDF) through CASA for all enrolled students.***

The information contained in this class outline is an abbreviated description of the course. Additional important information is contained in the departmental policies statement at http://www.math.uh.edu/~dog/13xxPolicies.doc and at your instructor's personal webpage. You are responsible for knowing all of this information.

Upon successful completion of this course students will understand the basic ideas of differential and integral calculus and some of their applications to business, the social sciences, and the life sciences. They will have an understanding of the importance in these disciplines of techniques of optimization of functions of one or several variables. They will be able to use technology to aid in deriving graphical and numerical solutions of stated problems. They will be able to translate ordinary language statements of problems into mathematical expression, develop mathematical solutions to such problems and explain their conclusions.

A student in this class is expected to complete the following assignments:

1 Prerequisite test and 3 Regular Exams

Final Exam

Online Quizzes – one per week.

Homework – on each section of the textbook covered in class

Poppers – in-class quizzes given daily starting the 3rd week of classes.

Test 1 (prerequisite): 8%

3 Regular Exams: 36% (12% each)

Final Exam: 24%

Online Quizzes: 12%

Daily Classroom Quizzes (Poppers): 10%

Homework: 10%

Total: 100%

The learning materials** for Math xxx, including the textbook, are found online on the CourseWare site at www.casa.uh.edu. Students are required to purchase an access code at the Book Store to access the learning materials.

Math 1314 – Topics List

Finding and Using Regression Models

Finding Limits and Derivatives

- Finding Limits
- Continuity
- Average Rate of Change
- Limit Definition of the Derivative
- Finding Derivatives Using Rules and Using Technology

Applications of Derivatives

- Rate of Change and Average Rate of Change Problems
- Break-Even Analysis and Market Equilibrium
- Marginal Analysis
- Average Cost and Marginal Average Cost Functions
- Elasticity of Demand
- Exponential Models
- Analyzing Polynomial Functions
- Analyzing Other Types of Functions
- Optimization

Integration

- Riemann Sums (by hand)
- Riemann Sums, Upper Sums and Lower Sums (using technology)

Indefinite Integrals
Definite Integrals (by hand and using technology)

Applications of Integration

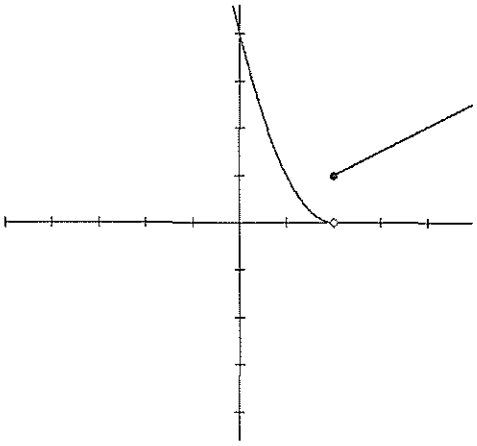
Basic Applications
Average Value of a Function
Area Between Two Curves
Producers' Surplus and Consumers' Surplus
Probability

Functions of Several Variables

Evaluating Functions of Several Variables
Finding Domain of a Function of Several Variables
Finding Partial Derivatives
Optimizing Functions of Two Variables

Whenever possible, and in accordance with 504/ADA guidelines, the University of Houston will attempt to provide reasonable academic accommodations to students who request and require them. Please call 713-743-5400 for more assistance.

Math 1314 Course Objectives

Objective #	Covered in Lesson #	Objective and Examples	Covered by the End of Week #
1	1,2	Find $\lim_{x\to a} f(x)$ or $\lim_{x\to\infty} f(x)$ from either the graph of f or given the function. Find one-sided limits from either the graph of the function or from a piecewise-defined function. Ex: Find $\lim_{x\to 3}\sqrt{x^2-3}$ Ex: Find $\lim_{x\to 2}\left(\frac{x^2-4}{x^2-3x+2}\right)$ Ex: Find $\lim_{x\to 5}\left(\frac{4}{x-5}\right)$ Ex: Find $\lim_{x\to 0} f(x)$ if $f(x)=\begin{cases}x^2+1, & x>0\\ 1-4x^2, & x\le 0\end{cases}$ Ex: Find $\lim_{x\to\infty}\left(\frac{x^2-4x+2}{x^3+2x^2+5x}\right)$ Ex: Find $\lim_{x\to\infty}\left(\frac{5x^2+3x-1}{2x^2+7x-4}\right)$ Ex: Find $\lim_{x\to\infty}\left(\frac{3x^3-9x+2}{5x^3-5x+3}\right)$ Ex: Use the graph to find $\lim_{x\to 2^+} f(x)$, $\lim_{x\to 2^-} f(x)$ and $\lim_{x\to 2} f(x)$ (if it exists). 	3

Math 1314 Course Objectives

2	3	Use the limit definition of the derivative to find the derivative of a polynomial function. Ex: Suppose $f(x)=3x^2-7x-4$. Find $f(x+h)$. Find $f(x+h)-f(x)$. Form the difference quotient. Use the limit definition of the derivative to find the derivative.	3
3	4,5,6,7	Find the first and second derivatives of a function (including exponential functions and logarithmic functions) using basic rules, product rule, quotient rule and/or chain rule. Find the first and second derivatives of each: Ex: $f(x)=3x^3-4x^2+7x-9+e^x+\ln x$ Ex: $f(x)=x^2e^x$ Ex. $f(x)=5^x$ Ex: $f(x)=\dfrac{5x+2}{3x-7}$ Ex: $f(x)=(3x^3-8)^5$ Ex: $f(x)=e^{3x^2+4}$ Ex: $f(x)=\ln(7x^2+3)$ Ex: $f(x)=\ln\left[\dfrac{x(x+2)^2}{(x-4)^5}\right]$	5
4	8	Find an equation of a tangent line to a function at a given value of x. Ex: Write an equation of the tangent line to $f(x)=3x^2-6x+2$ when $x=1$. Ex: Write an equation of the tangent line to $f(x)=e^{3x}$ at the point $(2, e^6)$. Ex: Write an equation of the tangent line to $f(x)=\ln(2x-3)$ at the point $(2, f(2))$.	6
5	8	Solve word problems that involve finding a rate of change at a given point. Ex: The population of a country is given by the function $P(t)=\dfrac{-1}{3}t^3+64t+5000$ where P is measured in thousands of people and t represents time in years with $t=0$ representing population now. Find the rate of change of the population in 2 years and in 4 years. Find the population in 2 years and in 4 years.	6
6	9	Solve problems involving marginal functions. Ex: Suppose a company determines that the cost to produce x units of its product is	7

		$C(x) = 100x + 200000$ dollars. The relationship between the unit price p and the quantity demanded x is $p = -0.02x + 400$. Find the profit function, the marginal profit, compute $C'(2000)$ and interpret your results. Ex: The cost to produce x units of a product is $C(x) = 100x + 200000$ dollars. Find the average cost function.	
7	10, 11	Find the x and y coordinates of the relative extrema of a function, using either the First Derivative Test (Lesson 10) or the Second Derivative Test (Lesson 11) to find the x coordinate. Ex: Find the x and y coordinates of the relative extrema of $f(x) = \frac{1}{3}x^3 - 4x^2 + 5$. Ex: Use the second derivative test to find the x coordinate of any relative extrema: $f(x) = x^2e^{2x}$	7
8	10	State intervals on which a function is increasing and intervals on which it is decreasing by analyzing the first derivative. Ex: Determine the intervals on which the function is increasing and the intervals on which the function is decreasing: $f(x) = \frac{1}{3}x^3 - 4x^2 + 5$	7
9	11	Find the x and y coordinates of any inflection points of a function. Ex: Find any inflection points: $f(x) = x^4 - 4x^3$	8
10	11	State intervals on which a function is concave upward and intervals on which it is concave downward by analyzing the second derivative. Ex: State intervals on which the function is concave upward and intervals on which the function is concave downward. $f(x) = x^4 - 4x^3$	8
11	12	Use factoring by grouping or the rational roots theorem to find rational zeros of a polynomial function of degree four or lower. Ex: Find any rational zeros or state that there are none: $f(x) = 2x^3 + x^2 - 2x - 1$ Ex: Find any rational zeros or state that there are none: $f(x) = x^3 - 3x^2 - 4x + 12$	8

Math 1314 Course Objectives

12	12	Use the guide to curve sketching to sketch the graph of a polynomial or exponential function. Ex: Use the guide to curve sketching to sketch $f(x) = x^4 - 4x^3 + 8$. Ex: Use the guide to curve sketching to sketch $f(x) = xe^x$.	9
13	13	Find the absolute extrema of a function over a closed interval or over $(-\infty, \infty)$. Ex: Find the absolute extrema of $f(x) = 2x^3 - 4x^2 + 3$ on the interval [-1, 1]. Ex: Find the absolute minimum: $f(x) = x^4 - 4x^3$.	9
14	14	Solve word problems involving optimization. Ex: Suppose you wish to fence in a rectangular shaped field on your farm. You have 3000 m of fencing to use. What dimensions of the field will give a maximum area? Ex: An open top box is made by cutting equal squares from each corner of a piece of cardboard measuring 10 inches by 15 inches and then folding up the resulting flaps. What are the dimensions that yield the largest volume, and what is that volume? Ex: A farmer wants to fence in a rectangular shaped pasture on his land. One side of the pasture will be along a river and will not need to be fenced. He has 500 yards of fencing material to use. What is the maximum area he can fence in? Ex: Postal regulations require that the girth plus length of a package sent through the postal service can be no more than 108 inches. A parcel has a square base. What are the dimensions of the box with maximum volume that can be made under these conditions?	10
15	15	Solve word problems involving exponential functions. Ex: Population of a city in 2000 was 2.4 million people. Three years later, the population was 2.51 million people. Assuming population grows exponentially, write an equation expressing the population of the city in terms of time. Use the equation to approximate the population in 2010. What will be the rate of change of the population in 2010?	10
16	16, 17	Find the antiderivative of a function (including exponential functions and logarithmic functions) using basic rules or substitution.	11

Math 1314 Course Objectives

		Ex: Find the antiderivative: $\int (3x^2 - 8x + 4e^x)dx$ Ex: Find the antiderivative: $\int \left(\frac{2x}{x^2+4}\right)dx$ Ex: Find the antiderivative: $\int \left(\frac{5}{x^4}\right)dx$ Ex: Find the antiderivative: $\int (e^{6x})dx$	
17	16	Solve simple initial value problems. Ex: Solve the initial value problem: $\left.\begin{array}{l} f'(x) = 4x + 7 \\ f(4) = -1 \end{array}\right\}$	11
18	18	Use Riemann sums to approximate the area under a curve. Ex: Suppose $f(x) = 3x^2 + 4$. Use Riemann sums to approximate the area under the curve on the interval [0, 4] using a. 4 subintervals and right endpoints b. 2 subintervals and midpoints c. 8 subintervals and left endpoints	12
19	19, 20	Find a definite integral. Ex: Evaluate $\int_1^3 (x^2 - 6x + 3)dx$ Ex: Evaluate $\int_0^4 (e^{3x})dx$ Ex: Evaluate $\int_1^2 x(x^2+4)^5 dx$ Ex: Evaluate $\int_3^5 \left(\frac{3}{2x-5}\right)dx$	13
20	19, 20	Use definite integrals to solve word problems. Ex: The management of a company has found that the daily marginal cost of producing x of items is given by $C'(x) = 0.000006x^2 - 0.006x + 4$. The fixed daily cost of producing the products is \$100. Find the total cost of producing the first 500 units.	13
21	19, 20	Find the average value of a function. Ex: Find the average value of $f(x) = 3x^2 - 4x + 1$ on the interval [-2, 4].	13
22	21	Find the area between two curves over a stated interval. Ex: Find the area between $f(x) = x^2 + 4$ and $g(x) = 3 - x$ between $x = -1$ and $x = 4$.	13
23	22	Evaluate a function of several variables at (a, b).	14

Math 1314 Course Objectives

		Ex: Suppose $f(x,y)=3x^2y-5xy^2+6xy+9$. a. Find $f(0,-2)$. b. Find $f(3,-2)$.	
24	23	Find first and second order partial derivatives of functions of two variables. Find the first and second order partial derivatives of each: Ex: $f(x,y)=3x^2y-5xy^2+6xy+9$ Ex: $f(x,y)=3x^2-7xy+6xy-8y+5$	14
25	24	Find relative extrema of functions of two variables. Ex: Find any relative extrema: $f(x,y)=3x^2-4xy+4y^2-4x+8y+4$	14

[Close]

Please select the exam.

◉ Active ○ All

Problem No	Points	Active	Question Text	Problem	Problem Set
1	10	True	Question 1 A clothing company manufactures a certain variety of ski jacket. The total cost of producing x ski jackets and the total revenue of selling x ski jackets are given by the following equations $C(x) = 22000 + 44x - 0.15x^2$ $R(x) = 300x - 0.1x^2$ $(0 \le x \le 1000)$ Use the marginal profit to approximate the actual profit realized on the sale of the 401st ski jacket. a) ○ $296.20 b) ○ $88,400.00 c) ○ $296.00 d) ○ $296.10 e) ○ $88,696.05 f) ○ None of the above.	View First	View All
2	10	True	Question 1 A music company produces a variety of electric guitars. The total cost of producing x guitars is given by the function $C(x) = 7700 + 50x - \frac{2}{25}x^2$ where $C(x)$ is given in dollars. Find the average cost of producing 150 guitars. a) ○ $74.00 b) ○ $207,700.00 c) ○ $89.33 d) ○ $595.56 e) ○ $39.67 f) ○ None of the above.	View First	View All
3	10	True	Question 1 Suppose the demand equation of a product is given by $x = -50p + 30000$ where the function gives the unit price in dollars when x units are demanded. Compute $E(p)$ when $p = 350$ and interpret the results. a) ○ 1.40, Inelastic b) ○ 0.71, Inelastic c) ○ 1.40, Elastic d) ○ 1.00, Unitary e) ○ 0.71, Elastic f) ○ None of the above.	View First	View All
			Question 1		

4 10 True

The demand for a company's product t months after it is introduced on the market can be expressed as

$$D(t) = 7500 - 2700\, e^{-0.06t}$$

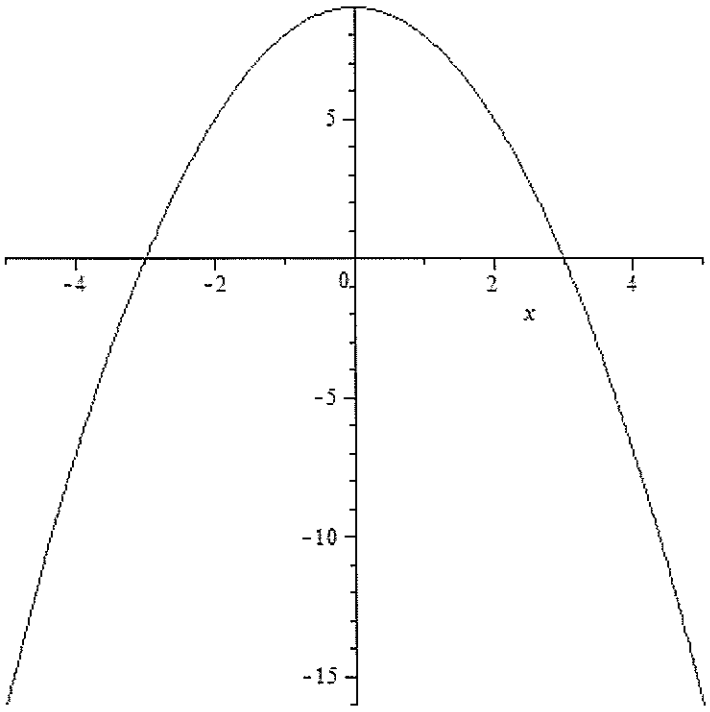
where $D(t)$ is the number demanded. How many units should the company expect to be demanded 8 months after it is first introduced on the market?

View First View All

a) ◯ 100
b) ◯ 7,522
c) ◯ 5,829
d) ◯ 7,478
e) ◯ 9,171
f) ◯ None of the above.

5 10 True

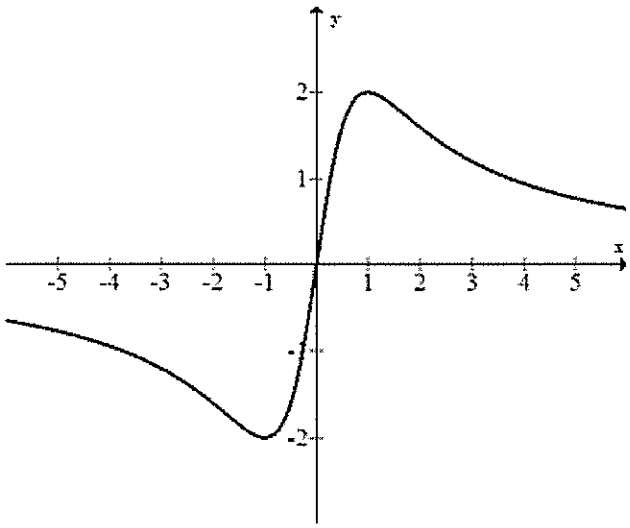
Question 1
The graph of f' is shown. Find the intervals on which f decreases.



View First View All

a) ◯ (0 , ∞)
b) ◯ (-∞ , ∞)
c) ◯ (-∞ , -3) ∪ (3 , ∞)
d) ◯ (-∞ , 0)
e) ◯ f is not decreasing anywhere.
f) ◯ None of the above.

Question 1
The graph of a function, $f(x)$, is given below. Find the absolute maximum value of this function.

6	10	True		View First	View All

a) ◯1
b) ◯0
c) ◯2
d) ◯-2
e) ◯-1
f) ◯None of the above.

7	0	True	Question 1 **This is a written question, worth 10 points. DO NOT place the problem code on the answer sheet. A proctor will fill this out after exam submission. Show all steps/work on your answer sheet for full credit.** Problem Code: 771 The half-life of a substance is 12 hours. Suppose a researcher starts an experiment with 150 grams of the substance. A. Identify two ordered pairs that represent the amount of the substance that is present at two different times. One ordered pair should include the initial quantity. B. Find an exponential regression model that gives the amount of the substance that is left after t hours, using the two points you identified in Part A. Round values to four decimal places when you write down your regression model. C. Find the amount of the substance that is left after 56 hours using the exponential model you found in Part B. Round your answer to the nearest tenth of a gram. D. Find the rate at which the amount of the substance is changing after 56 hours using the exponential model you found in Part B. Round your answer to the nearest tenth and include appropriate units. a) ◯I have placed my work and my answer on my answer sheet. b) ◯I want to have points deducted from my test for not working this problem. c) ◯None of the above. Question 1 **This is a written question, worth 15 points. DO NOT place the problem code on the answer sheet. A proctor will fill this out after exam submission. Show all steps/work on your answer sheet for full credit.** Problem Code: 871 Analyze the function: $f(x) = 3.1x^4 - 2.7x^3 - 5.2x^2 - 7.4x - 2.8$. Round values to 2 decimal places on all parts of this problem.	View First	View All

8	0	True	A. Find any critical numbers. B. State intervals (using interval notation) on which the function is increasing. State intervals (using interval notation) on which the function is decreasing. C. State intervals (using interval notation) on which the function is concave upward. State intervals (using interval notation) on which the function is concave downward. D. State the x and y coordinates of any inflection points. a) ◯ I have placed my work and my answer on my answer sheet. b) ◯ I want to have points deducted from my test for not working this problem. c) ◯ None of the above.	View First	View All
9	0	True	Question 1 **This is a written question, worth 15 points. DO NOT place the problem code on the answer sheet. A proctor will fill this out after exam submission. Show all steps/work on your answer sheet for full credit.** Problem Code: 951 You want to create an open box by cutting equal squares from the four corners of a rectangular-shaped sheet of cardboard and then folding up the resulting flaps. The dimensions of the cardboard are 9 inches by 12 inches. A. Write a function that will give the volume of the box. B. Find the critical numbers for this function. C. Find the dimensions of the box with maximum volume. D. Find the maximum volume of the box. a) ◯ I have placed my work and my answer on my answer sheet. b) ◯ I want to have points deducted from my test for not working this problem. c) ◯ None of the above.	View First	View All