UUUCC Appr 2/22/05 Senate Info 3/29/05 04-54

Undergraduate Distance Education Review Form

(Required for all courses taught by distance education for more than one-third of teaching contact hours)

Existing and Special Topics Course

Course: MATH 115 – Applied Mathematics for Business

Instructor of Record: Dr. Frederick Adkins **phone:** 724-357-3790 **e-mail:** fadkins@iup.edu

FEB 25 2005

Step One: Department or its Curriculum Committee

The committee has reviewed the proposal to offer the above course using distance education technology, and responds to the CBA criteria as follows:

1.	Will an instructor who is qualified in the distance education delivery method as well as the discipline teach the course?	X Yes	___ No
2.	Will the technology serve as a suitable substitute for the traditional classroom?	X Yes	___ No
3.	Are there suitable opportunities for interaction between the instructor and student?	X Yes	___ No
4.	a. Will there be suitable methods used to evaluate student achievement?	X Yes	___ No
	b. Have reasonable efforts been made to insure the integrity of evaluation methods (academic honesty)	X Yes	___ No

FEB 18 2005

5. Recommendation:

X Positive (The objectives of the course can be met via distance education.)

___ Negative

Gary Stowell / Frederick Adkins — February 10, 2005

signature of department designee — date

If positive recommendation, immediately forward copies of this form and attached materials to the Provost and the Liberal Studies Office for consideration by the University-Wide Undergraduate Curriculum Committee. Dual-level courses also require review by Graduate Committee for graduate-level offering. Send information copies to 1) the college curriculum committee, 2) dean of the college, and 3) Dean of the School of Continuing Education.

Step Two: UNIVERSITY-WIDE UNDERGRADUATE CURRICULUM COMMITTEE

X Positive recommendation

___ Negative recommendation

Gail Sechrist 2/25/05

signature of committee chair — date

Forward this form to the Provost within 24 calendar days after review by committee.

Step Three: Provost

✓ Approved as distance education course

___ Rejected as distance education course

[signature] 2/26/05

signature of Provost — date

Step Four:

Forward materials to Dean of the School of Continuing Education.

Course Proposal for Review
MATH115--- Applied Mathematics for Business
Distance Education Format
Instructor of Record: Dr. Frederick Adkins
(724) 357-3790
fadkins@iup.edu

(A) Written statements to address the four CBA criteria:

1. **Will an instructor who is qualified in the distance education delivery method as well as the discipline teach the course?**

   The instructor of record is Dr. Frederick Adkins. Dr. Adkins has been involved in distance education since 1999. In 1999 Dr. Adkins was selected for and participated in the IUP Instructional Design Center WebCT Development Stipend Program. This was a week-long intensive introduction to WebCT including the opportunity to build a WebCT course. Dr. Adkins used this experience to add supplemental WebCT based material to his MATH123 and MATH124 courses.

   In the following year Dr. Adkins attended a workshop "CAPE— Distance Education / Videoconference Operator Training" which was held at IUP. This training focused on communication needs and operation of videoconference equipment.

   While not directly teaching classes, Dr. Adkins has had an active role in shaping the future of distance education in the Pennsylvania State System of Higher Education. From 2000-2004 he was the technical specialist for the PASSHE Center for Distance Education and the Keystone University Network. He provided software development and support for the State System's WebCT and Blackboard installations. From 2002-2004 he was a member (with Dr. Kolb) of the planning and oversight team the "Keystone University Network Workgroup."

   Dr. Adkins has also worked with Dr. Kolb to support IUP's efforts to market distance education course offerings, to provide training for IUP staff in usage of web-based tools from the Center for Distance Education / Keystone University Network, and to directly assist faculty and students with technical questions. IUP's distance education programs and courses are advertised on a searchable web software package that he wrote (see: http://www.keystoneu.net/deprograms and http://www.keystoneu.net/decourses).

Through his involvement in statewide distance education activities, Dr. Adkins participated in the "EDU101 Online Instructor Certificate Course." This is an eCollege Online Course taken from December 2001-February 2002 for training faculty to teach courses online.

Dr. Adkins has also participated in a variety of activities and conferences focusing on distance education including:

- SSHE Network Operations Center--- MCU Videoconference Operator Training. October 10-11, 2000. A selected group of faculty and technical staff across the PASSHE participated in this two day training workshop on usage of videoconferencing multipoint control unit (MCU) bridge operation and distance education hardware.
- Blackboard Users Summit 2001, Washington, DC. April 5-6, 2001. This was a symposium sponsored by Blackboard to showcase online education.
- *Educause 2001 Conference. Indianapolis.* October 28-31, 2001. Educause is an organization with a dedication to serving the technology needs of higher education. I went to this conference with the specific purpose to meet with the Independent Blackboard Users Group.
- Blackboard Users Conference 2003, Baltimore, MD. February 25-27, 2003.
- Reviewer of the 2004 PASSHE Distance Education Program Investment Grants

In a letter to support Dr. Adkins' application for promotion, Dr. Paddy O'Hara-Mays, former Director of the SSHE Center for Distance Education and Vice-President of the Keystone University Network wrote:

> He has been an exceptional resource person for these organizations. He has an extensive knowledge of technology, sharp programming skills, a good grasp of System politics, and a sincere desire to help faculty use eLearning technologies. ... Much of our success with these organizations was due to Rick's assistance and the skills he possesses.

Dr. Adkins has used and shared the skills he acquired through workshops and activities such as:

- Presenter at "Faculty Professional Development Day: Hands-on WebCT workshop," California University of Pennsylvania, May 2001.
- By supporting activities at "Emerging Educational Technologies Conference," Lock Haven University of Pennsylvania May 2000.
- Author of a newsletter "WebCT Tip of the Week" (2000-2001).
- Participant as a faculty consultant for PASSHE Online Learning Network RFP Vendor Interviews in Harrisburg (2001).

2. **Will the technology serve as a suitable substitute for the traditional classroom?**
   Material for the online course will include interactive exercises that use computer generated prompts to address student questions and give hints for subsequent steps. Additionally there are video mini-lectures, audio clips annotating step-by-step solutions, and online try-it-yourself exercises. It is anticipated that a hyper-linked online textbook will be used to direct students to read and review necessary textbook pages. Instructor will provide interactive assistance during "office hours" via use of HorizonLive web-based videoconferencing software.

3. **Are there suitable opportunities for interaction between the instructor and student?**
   Students will be able to interact with the instructor during "office hours" via use of HorizonLive web-based videoconferencing software. Students will be able to send email, use chatrooms, and telephone for assistance.

4. **Evaluation**
   a. **Will there be suitable methods used to evaluate student achievement?**
      Students will be required to complete written homework assignments, take online quizzes, and complete examinations over chapters of material. Students will have a project to complete at the end of the semester that uses content spanning the entire course.

   b. **Have reasonable efforts been made to insure the integrity of evaluation methods (academic honesty)?**
      Written homework exercises will be submitted by either US Postal Mail, scanning and emailing, or by fax. Homework should be the student's own work (verified by handwriting consistency), but students are allowed to seek help from a qualified tutor. Online quiz and exam materials are algorithmically generated so each student will receive different numbers in similar type problems. As the students will have time limitations and receive different problems this should help eliminate cheating. Instructor is considering using proctored testing services for the final exam.

(B) Syllabus to show how objectives of the course will be fulfilled.

MATH 115 Applied Mathematics for Business (4 credits)
Summer Session 2005 Dates: 6-20-2005 to 8-11-2005
Section 801

Instructor:

Dr. Frederick Adkins
212 Stright Hall
Indiana University of Pennsylvania
Indiana, PA 15705
Work Phone: (724)357-3790
Home Phone: (724)349-7346 (please no calls after 8:30pm)
Email: fadkins@iup.edu

Description (From Catalog):

Offers a review of elementary functions including logarithmic and exponential functions. Business majors are introduced to the mathematics of finance and central ideas of the calculus, including limit, derivative, and integral. Applications to business and economics are emphasized.

Prerequisites: MATH 105 or equivalent high school preparation (score of 20 on Basic Algebra placement exam) or permission of the Mathematics Department chairperson.

Required Textbook:

Lial, Greenwell, and Ritchey. (2005). *Calculus with Applications, Brief Version.* 8th Edition, New York: Addison-Wesley. Bundle ISBN:032126830X

* Because the bundle is required students should be purchasing new textbooks. (New books come with the bundled materials for free).

Technology:

Students will need to purchase the student version of Scientific Notebook. A 30-day free trial is available from http://www.mackichan.com There is a 6-month license student version which is not advertised and is cheaper than the ongoing license. To get the 6-month version, call 877-724-9673. Be sure to ask for Scientific Notebook because they sell other software packages.

Students will need to install free plugins for MathXL available at:
http://www.mathxl.com/info/wizard.asp?bookCode=cwa8l&mml=yes
Also from this site, they will need to download software for Adobe Acrobat Reader, Macromedia Flash Player, and QuickTime Player unless they already have this software. There may be additional plugins required depending on the operating system students. It is suggested to use Microsoft Internet Explorer for the browser.

Students should also have access to software similar to Microsoft Word and Excel.

(C) Official catalog description and pre-requisites.

MATH 115 - Applied Math for Business
Credits: 4.00
Offers a review of elementary functions including logarithmic and exponential functions. Business majors are introduced to the mathematics of finance and central ideas of the calculus, including limit, derivative, and integral. Applications to business and economics are emphasized.
Lecture: 4.00
College: College of Nat Science and Mathematics
Department: Mathematics
Restrictions:
Must be enrolled in one of the following Level(s):
Graduate
Undergraduate
Pre-requisites: MATH 105 Minimum Grade: D or Placement test math Basic Algebra 0020 or Permission of the Mathematics Department Chairperson

Course Objectives:

Students will be able to:

1. apply pattern recognition to the study of mathematics;
2. understand the concept of function and applications of functions in business and economics;
3. develop and apply formulae applicable to the mathematics of finance;
4. interpret functions expressed analytically and graphically;
5. understand the limit process and how it pertains to functions in business and economics;
6. calculate the derivatives of common functions and interpret their meanings;
7. calculate the integrals of common functions and interpret their meanings;
8. demonstrate computational skills and knowledge of the conceptual mathematical framework necessary for the study of business and economics.

Course Outline:

A. Library of Functions (10 hours)
   1. Functions
   2. Linear Functions
   3. Quadratic Functions
   4. Polynomial Functions
   5. Rational Functions
   6. Exponential Functions
   7. Logarithmic Functions

B. Mathematics of Finance (6 hours)
   1. Simple Interest
   2. Compound Interest
   3. Future Value of an Annuity
   4. Present Value of an Annuity

C. The Derivative (11 hours)
   1. Rates of Change
   2. Limits
   3. The Derivative
   4. Power Rules and Summation Rules
   5. Product and Quotient Rule
   6. Chain Rule: Power Form
   7. Marginal Analysis in Business and Economics

D. Graphing and Optimization (8 hours)
   1. Continuity and Graphs
   2. First Derivative and Graphs

D. Graphing and Optimization (8 hours)
   1. Continuity and Graphs
   2. First Derivative and Graphs
   3. Second Derivative and Graphs
   4. Other Curve Sketching Techniques
   5. Optimization: Absolute Maxima and Minima

E. Additional Topics in Differentiation (5 hours)
   1. The Constant *e* and Continuous Compound Interest
   2. Derivatives of Exponential and Logarithmic Functions
   3. Chain Rule: General Form

F. Integration (8 hours)
   1. Antiderivatives and Indefinite Integrals
   2. Integration by Substitution
   3. Introduction to the Definite Integral
   4. The Fundamental Theorem of Calculus
   5. Applications of the Integral to Business and Economics

The remaining eight hours are for review classes and exams.

Evaluation Methods:

The final grade will be determined as follows:

Grade	Percentage	Item	Relative Weight
A	90% -- 100%	Three Exams	51%
B	80%-- 89%	(each exam is 17%)	
C	70%-- 79%	Quizzes&Participation	10%
D	60%-- 69%	Homework	15%
F	below -- 60%	Projects	5%
		Final Exam	19%

Email:

Students will be expected to check their email and use the WebCT course account for class updates as well as participate in the electronic bulletin board discussions.

Expectations:

I expect that you:

- Take responsibility for your own learning.
- Complete homework as indicated and in the manner described.
- Read the assigned material in addition to completing the exercises.
- Keep pace with the material-- this requires working on a daily basis.
- Seek assistance when difficulty arises.
- Take notes when appropriate and actively participate in web-based classroom activities.

You can expect from me:

- Assistance during posted office hours or by appointment.
- Timely return of materials.
- Clarity of my expectations and intentions.
- Fairness and reasonableness.

I am willing to help you in any way I can to succeed in this course, but I also expect you to be working hard toward the same goal.

Recommendations:

As the semester progresses you will develop habits as to how you study and do your work for your classes. It is important to begin the semester in the way you would like to finish it; consistent work and time spent on material as it is covered will dramatically increase your understanding, ability to keep pace with the course, and (from a student's perspective) should save time when compared to trying to catch-up and cram at the end of a semester.

Even though this is a web-based class, you should keep a notebook just like you would in a classroom lecture-based class. You should also be asking yourself questions like "is this clear to me?" or "do I need to see more examples of this?" as you are going through the online material. These are the types of questions you might be asked by a traditional classroom instructor—in a web-based class you need to monitor your own learning and seek additional help when needed.

(C) Official catalog description and pre-requisites.

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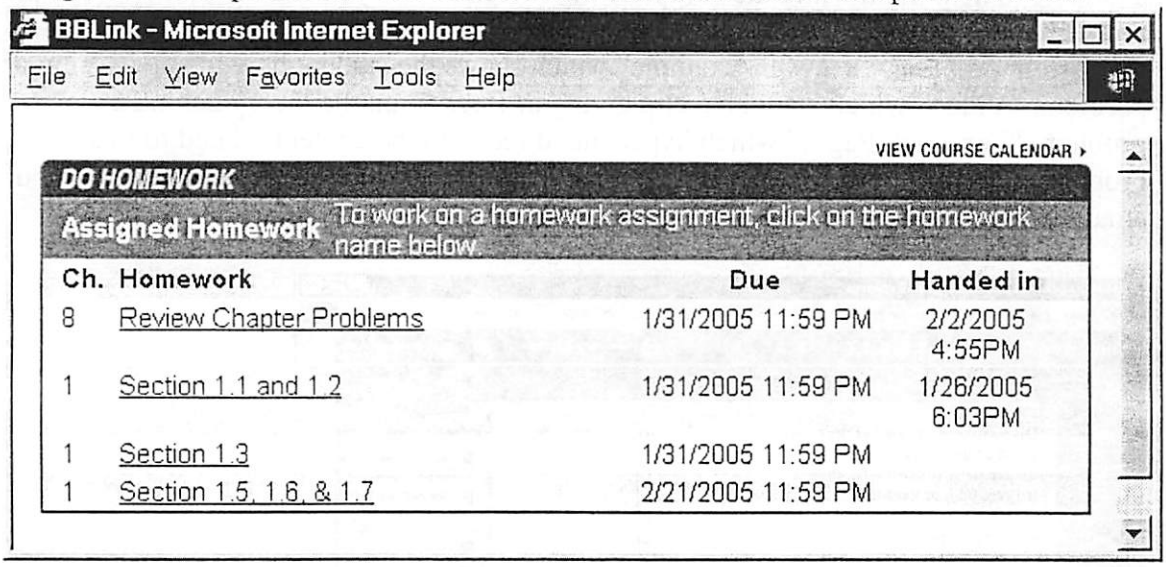
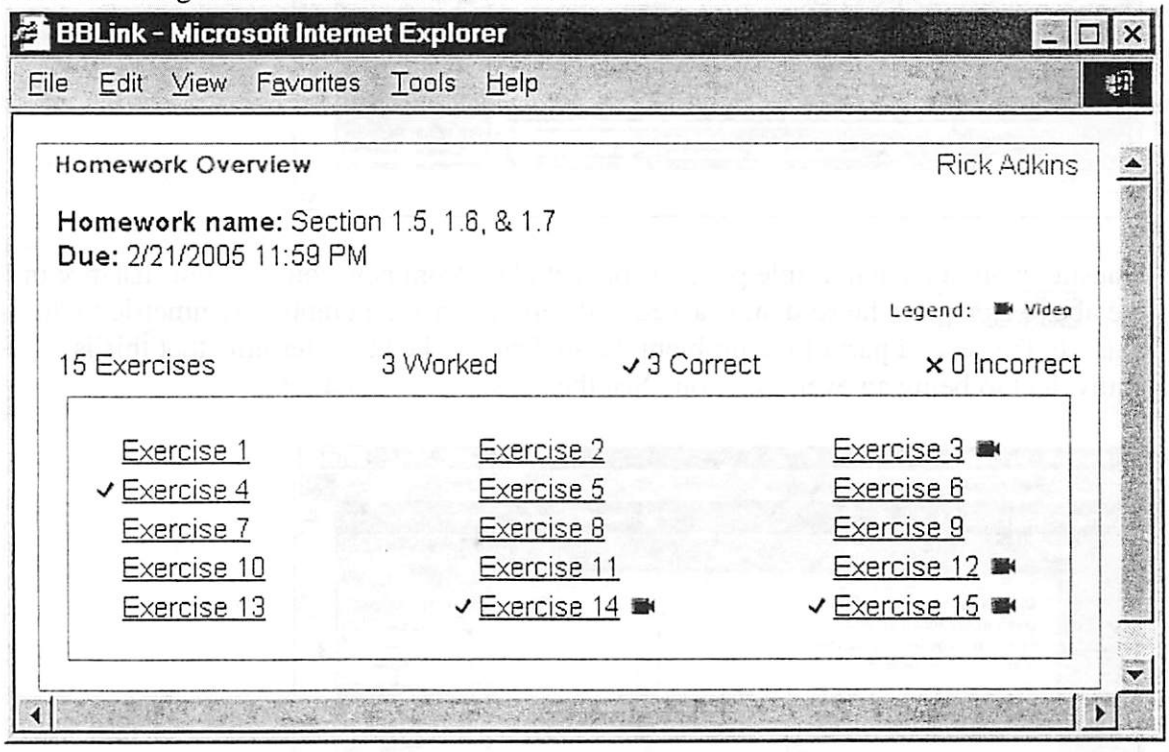
Lecture: 4.00
College: College of Nat Science and Mathematics
Department: Mathematics
Restrictions:
Must be enrolled in one of the following Level(s):
Graduate
Undergraduate
Pre-requisites: MATH 105 Minimum Grade: D or MATH 110 Minimum Grade: D or Placement test math Basic Algebra 0020

(D) **Sample lessons / Sample Exercises.**

After reviewing instructional content on a section, the student will be prompted to start doing homework problems. The screen below shows the homework problem index.

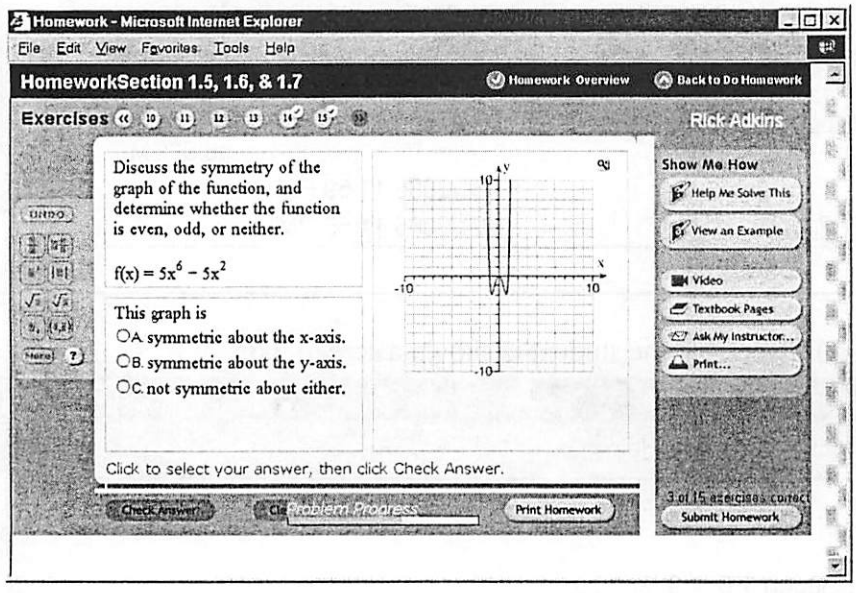


After selecting a section to work on, the student is shown a screen like:

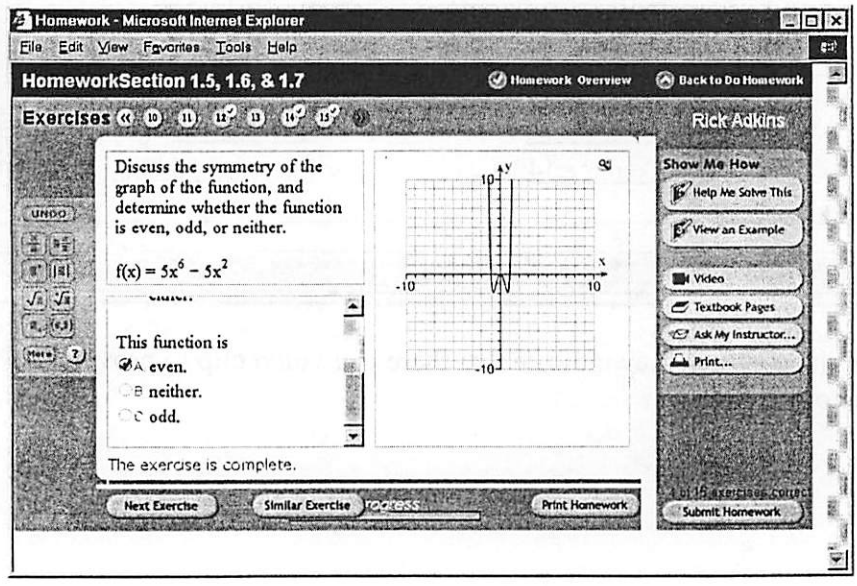


The exercises with the video camera key indicate that there is a video clip to provide instruction for that type of exercise.

Students can work on exercises in any order they choose and have a variety of tools available to help them while the complete the exercises. As you can see from the sample problem below, there are links for "Help Me Solve This" which step the student through the current problem, "View an Example" which shows the student how to solve a similar problem, "Video" which is a video clip giving instruction on the theory behind a problem, "Textbook Pages" which hyper-link directly to the content related to this problem in the online textbook, and "Ask My Instructor" which sends the instructor and email with the students question.



Questions often have multiple parts to connect ideas from new content. For instance in the above example, the student is asked to determine that the graph is symmetric to the y-axis. In the second part of the problem the student is asked to determine that this is equivalent to being an even function. See the question continuation:



Graphing Functions using Calculus!

This material covers content in your textbook from Section 3.1 and a portion of Section 3.3.

Objectives for Section 3.1 Online Lesson

The student will

- Understand and be able to define in your own words the following terms:
  - Critical Point
  - Increasing
  - Decreasing
  - Relative Maximum or Minimum
- Be able to create a sign diagram for the derivative on a number line.
- Be able to sketch the shape of a function near a critical point.
- State the first derivative test.
- Sketch the graph of a polynomial using these ideas.
- Sketch the graph of a rational function using these ideas.
- Be able to choose appropriate window on graphing calculator for a graph.

After reviewing the rest of this material below, please be sure to revisit this section and check to see if you have mastered all of these objectives.

New Terminology

Mastering the language of this material will improve your ability to read problem set and exam instructions.
Clear mastery of the terminology allows you to quickly know exactly what is being asked.
A firm grasp of the terminology allows you to confidently interact with classmates and instructor during in-class activities.

Here are the important terms from this section:

- Critical Point
- Increasing
- Decreasing
- Relative Maximum or Minimum

Please read your textbook and identify definitions for each of these.
Try to put the definitions in your own words.

Note your book, other texts, and myself will use the terms *Critical **Point*** and *Critical **Value*** interchangeably.

The same is true for ***Relative Maximum*** and ***Local Maximum.*** (Similar statement true for Minimums.)

Here is an online tutorial that reviews some of these basic ideas. This tutorial is on using the

derivative to detect increasing and decreasing functions. Local maximum and local minimum are also defined.

The examples used in this tutorial require a "LiveMath" plugin (free from the www.livemath.com site) in order to interact with the content. Please at least view the content and if you are computer savvy, your experience would be more interesting with the proper plugin.

Graphing Functions using Calculus!

In this sub section we will focus on polynomials. You should also review the examples from the text that other functions such as Example 6 page 248.

Here are the basic steps that we will use for graphing:

1. Take derivative of function
2. Find Critical Points by solving for x when derivative f'=0 OR undefined
3. Identify intervals where function is **increasing** or f'>0
4. Identify intervals where function is **decreasing** or f<0
5. Determine whether each Critical Point is a Local Max, Local Min, or neither
6. Collect a table of values, plot points, graph function

Consider the function
f(x) = 3x^4 -8x^3+6x^2

STEP 1 We need to take the derivative. Try this cool web tool:

Differentiate [3x^4 -8x^3+6x^2] with respect to [x] [Differentiate]

STEP 2 We need to find when the derivative is zero or undefined.
We do this by solving for which x satisfy:

12x^3-24x^2+12x = 0

The way to solve this with algebra is to factor first ... try it:

[12x^3-24x^2+12x] [Factor]

From the factored form f'(x) = 12x(x-1)^2
we can easily pick off the critical values of x=0 and x=1.

We can do this by using the solve feature below too.

Solve [12x^3-24x^2+12x=0] for [x] [Solve]

STEP 7 Wait if you are keeping track next should be steps 3 and 4, that's right STEP 7=3+4.
We do these two steps at the same time.

Create a number line. Divide the number line into intervals split at the critical points. Test a point between each of the critical points by putting into the derivative formula. You will need to

determine where the derivative is negative (so function is decreasing) or derivative is positive (so function is increasing). Your textbook covers an example of this in section 3.3 on page 264.

STEP 5 Use the intervals to see where the graph switches from being increasing to decreasing (going from left to right) that we have a local max or "cap" shaped curve.

Where the function switches from being decreasing to increasing (going from left to right) that we have a local min or "cup" shaped curve.

STEP 6 Use the function formula to get some points to plot.
put x=0 and x=1 into f(x) = 3x^4 -8x^3+6x^2
yields (0,0) and (1,1)
plot these points on your graph and use the shape behavior and where the function is increasing to get an idea of the rest of the graph! You are done ... check with the plotting tool below:

In general to use a graphing calculator we need to compute the f(x) values at each of the critical points. This will allow us to set a reasonable window to view the function in. Since the critical points are the "extreme" values of the functions they give us a guess at the range of values we will be interested in looking at for the function.

Plot y=3x^4 -8x^3+6x^2 from : x = -5 to x = 5 and y = -5 to y = 5 Plot

Practice (This is to be turned in Friday)

Now that you have seen how to do this, repeat the above with the functions
(Homework Part A): [f(x) = x^3-2x^2+x+11]
and
(Homework Part B): [f(x) = 8/(x^2+4)]
You can re-enter the functions over the contents in the orange boxes above or do this on pencil and paper. You should turn in a homework paper that clearly indicates each of the basic six steps. Be sure to neatly graph the function too.

Critical Points when the Derivative is Undefined

Here is another online example. This will present how to use a TI-85 calculator to graph the function f(x)=abs(x^2-1) and its derivative. View Graphing Simulation

Notice the corners in the function are associated with discontinuities in the derivative.

What does the calculator do with trying to graph the inequalities?

Self-Check and Review

Hopefully now you can more clearly state definitions to these in your own words:

- Critical Point
- Increasing

- Decreasing
- Relative Maximum or Minimum

Did you try to say *out loud* definitions for each?

Have you mastered the other objectives?

Please take the following online quiz. No score will be recorded for you, but this is very helpful review (and maybe you will see an exam question just like this on the next exam!): View Graphing With Derivatives Quiz.

What's Next?

Doing some more examples, and going over using the Second Derivative (section 3.3) to further help us graph functions. Please read section 3.3 of your text and consider viewing this tutorial too: View Graphing With Second Derivatives.