Calculus Credit by Examination

What is it?
A way for entering students who earned an A or B in a robust high school calculus course to earn college credit for MTH 235 Calculus at Doane.

Is this for me?
Yes, it is, if you earned an A or B in your high school class, you can successfully answer the sample questions below, and you pass our test. The important topics are included below.

Topics
1. Describe what a limit, a derivative, and an integral represents.
2. Estimate limits using a graph or numerical methods.
3. Compute limits using direct substitution, algebra, and L'Hopital's rule. This includes one-sided limits and limits at infinity.
4. Explain the role that limits play in determining if a function is continuous at a point.
5. Compute derivatives using the limit definition, the constant multiple rule, the sum/difference rules, the product rule, the quotient rule, and the chain rule including trigonometric, exponential, and logarithmic functions.
6. Sketch a graph of a function, its derivative, and its second derivative given the graph of one of the other functions.
7. Use implicit differentiation to find a derivative.
8. Use a derivative to find the tangent line of a function at a point.
9. Find extrema, intervals of increasing/decreasing, and intervals of concavity using derivatives.
10. Solve optimization problems and related rate problems.
11. Use a Riemann sum to approximate an integral.
12. Compute integrals using the constant multiple rule, the sum/difference rules, and u-substitution.

Sample questions
1. A fish population in a particular pond is approximated by $P(t) = 10e^{0.3t}$ where t is measured in months. Calculate $P'(9)$ and explain what this means about the population.
2. Based on the graph of $f(x)$ below, explain why $\lim_{x \to (-1)} f(x)$ does not exist.

0.5

−1.5   −1   −0.5   0
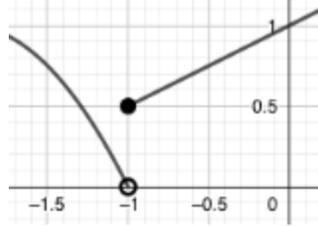
3. Pollutants are leaking out of an underground storage tank at a rate of $r(t) = 0.007t^3 - 0.1t^2 + 11.1$ gallons per day where t is measured in days. Compute $\int_4^{10} r(t)dt$ and explain what it tells us.

How does it work?
- Before taking the test, talk with a math faculty member about your high school course and your solutions to the sample questions.
- Register for the exam (which is typically given on Enrollment Days).
- The exam can only be attempted once and cannot be taken after enrolling in MTH 235 Calculus.
- The test must be completed in one hour. No notes or books are permitted, but a scientific calculator is allowed.
- If a passing score is attained,
  - a tuition charge of $75 per credit must be paid before adding the 4 credits for MTH 235 Calculus to your transcript.
  - the payment must be made before registering for a course that requires MTH235 as a prerequisite (usually by October of your first year)
  - financial aid cannot be used to pay for the course
  - the credit is only applicable at Doane University
- Review your results with a math faculty member to determine appropriate scheduling options.