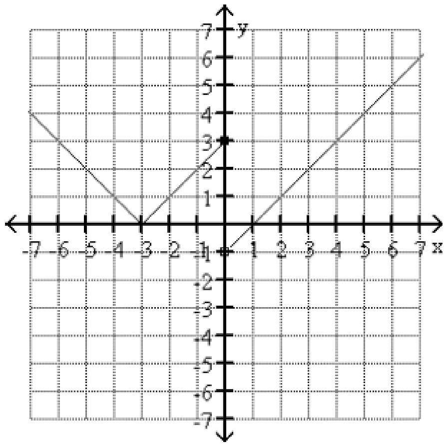
MAT211 Brief Calculus

Description: Foundations of differential and integral calculus, including applications to business and economics. Not open to students with credit in MAT 221 or MAT 231.

Prerequisites: MAT 151 College Algebra

Learning Outcomes	Sample Problems
1.(Evaluation Level) Evaluate limits of various functions.	$\lim_{x \to 0^-} f(x)$ and $\lim_{x \to 0^+} f(x)$ 
2.(Application Level) Implement rules of continuity.	Find all points of discontinuity x=a, then find the limit at x=a given $f(x) = \frac{x^2-4}{x+2}$.
3.(Evaluation Level) Evaluate derivatives of various functions using the product, quotient and chain rule, as well as the rule for exponential and logarithmic functions using technology when appropriate.	*Write the equation of the tangent line at x=1 for $f(x) = (-2x^2 + 3x - 4)(-4x + 5)$. *Find the marginal average revenue given $R(x) = 2000\left(1 - \frac{x}{700}\right)^2$ where R(x) is the total revenue from the sale of x stereos. *The sales in thousands of units of a new type of product are given by $S(t) = 130 - 90e^{-0.9t}$, where t represents time in years. Find the rate of change of sales at the time t=5. *Assume the total revenue from the sale of x items is given by $R(x) = 39\ln(x+1)$, while the cost to produce x items is $C(x) = \frac{x}{4}$. Find the approximate number of items that should be manufactured so that profit, R(x) – C(x), is maximum.
4.(Application Level) Apply rules for graphing algebraic functions using appropriate technology.	Given $f(x) = 2x^3 - 12x^2 + 18x$ a) graph and label all extrema, b) determine the concavity and inflection points when applicable.
5.(Application Level) Solve application problems including marginal analysis using technology when appropriate.	**Cost with Fixed Area**: A fence must be built to enclose a rectangular area of 20,000 ft^2. Fencing material costs \$2.50 per foot for the two sides facing north and south, and \$3.20 per foot for the other two sides. Find the dimensions of the rectangle with the least expensive fence cost.

6.(Application Level) Apply rules of integration to find the anti-derivative of various functions.	*A company has found that its expenditure rate per day (in hundreds of dollars) on a certain type of job is given by $E'(x) = 6x + 12$, where x is the number of days since the start of the job. Find the expenditure if the job takes 6 days. *After a new firm starts in business, it finds that its rate of profit (in hundreds of dollars) after t years of operation is given by $P'(t) = 3t^2 + 4t + 6$. Find the profit function if P(0)=0.
7.(Evaluation Level) Evaluate the definite integral of various functions using the Fundamental Theorem of Calculus and technology when appropriate.	*Find the area of the region bounded by the graphs of the given equations. $y = 3x + 18$ and $y = x^2$. *Suppose a company wants to introduce a new machine that will produce a rate of annual savings (in dollars) given by the function S'(x), where x is the number of years of operation of the machine, while producing a rate of annual costs (in dollars) given by the function C'(x) $S'(x) = 218 - x^2$ and $C'(x) = x^2 + \frac{9}{5}x$ a) For how many years will it be profitable to use this new machine? The number of profitable years is ______ . b) What are the net total savings during the first year of use of the machine?
8.(Application Level) Solve business/economics problems using the appropriate rules and/or methods.	***Cost and Revenue:** For a certain product, cost *C* and revenue *R* are given as follows, where x is the number of units sold (in hundreds) Cost: $C^2 = x^2 + 100\sqrt{x} + 50$ Revenue: $900(x-5)^2 + 25R^2 = 22500$ a) Find and interpret the marginal cost $\frac{dC}{dx}$ at x = 5. b) Find and interpret the marginal revenue $\frac{dR}{dx}$ at x = 5.