

## **TOPICS COVERED BY THE MATHEMATICS EXAM AND DS 710**

The following is a list of topics which will be covered on the Math Exam and DS 710 Course. You must satisfy this requirement by passing either the Math Exam or DS 710. **THIS REQUIREMENT CANNOT BE WAIVED WITH PREVIOUS COURSE WORK OR OTHER EXAMS.** No notes, calculators or tables are allowed for the exam. Suggested texts for studying are located below. If you wish to take the Math Exam rather than DS 710, please contact the testing center in ADMIN 152, (515)338-2271.

### TOPICS FROM BASIC/INTERMEDIATE ALGEBRA

(Knowledge assumed)

Real numbers and rules of operation (e.g., distributive law)

Exponents and rules

Expressions and the order of operations

Equations and inequalities and rules of manipulation

Solving 2 equations/2 unknowns simultaneously

### FUNCTIONS (Knowledge assumed)

Graphs and Cartesian coordinates

Linear functions and slopes

Linear models

Nonlinear functions –

    Quadratic functions: finding roots and vertex of parabola

    Polynomials and factoring

    Rational functions

    Exponential functions

    Logarithmic functions and rules of logarithms

### WORD PROBLEMS USING INTERMEDIATE ALGEBRA

(familiarity assumed)

### RATES OF CHANGE

Rates of change – constant, average, instantaneous

Limits

Definition of derivative

Graphical and algebraic looks at derivative

Rules of differentiation – sum, product, quotient rules

Chain rule for composite functions

### APPLICATIONS OF DERIVATIVES

Minima and maxima

Types of candidate solutions (critical points)

Tests of candidate solutions –

    Direct test

    First derivative test

    Second derivative test

Curve sketching

Inflection points

Incremental costs, revenue and profit

### MATHEMATICS OF FINANCE

Subscripted variables and summation notation

Simple interest

Compound interest

Present and future value

Solving for number of periods and interest rate

Continuous compounding

Doubling time

Simple annuities

Sinking funds

Present value of an annuity

Amortization

Owner's equity

Annuities due

### Texts:

Mathematics with Applications, by Lial, Hungerford, Miller

Mathematics for Business, by Schmidbauer & Platt

**PRACTICE EXAM FOR THE MATHEMATICS REQUIREMENT**

Questions 1 and 2 refer to the following: Profit,  $p(x)$ , is represented by the function  $p(x) = 200x - x^2$  where  $x$  represents the number of units produced.

1. Find the marginal profit when production equals 80 units.  
(a) 40    (b) 99.5    (c) 100    (d) 9600    (e) none of these
2. What is the value of profit when profit is maximized?  
(a) 100    (b) 200    (c) 9900    (d) 10,000    (e) none of these
3. Find the simultaneous solution to the system of equations  $6x - 2y = -7$  and  $5x + 3y = 28$ .  
(a)  $(\frac{9}{11}, \frac{24}{11})$     (b)  $(4, -7)$     (c)  $(\frac{5}{4}, \frac{29}{4})$     (d)  $(\frac{7}{6}, -6)$     (e) none of these
4.  $\ln 50 = ?$   
(a)  $2 \ln 25$     (b)  $5 \ln 5 + \ln 2$     (c)  $2 \ln 5$     (d)  $\ln 2 + 2 \ln 5$     (e) none of these
5. Two thousand dollars are put in an account that earns 10% compounded semi-annually. How much money is in the account at the end of the year?  
(a) \$2200    (b) \$2205    (c) \$2220    (d) \$2400    (3) none of these
6. If  $y = \sum_{i=2}^4 (3x_i - 2)^2$ , then  $y =$   
(a)  $3 \sum_{i=2}^4 (3x_i^2 - 4x_i) + 4$     (b)  $3 \sum_{i=2}^4 (3x_i^2 - 2x_i) + 16$     (c)  $3 \sum_{i=2}^4 (3x_i^2 - 4x_i) + 12$   
(d)  $3 \sum_{i=2}^4 (3x_i^2 + 4x_i) + 16$     (e) none of these
7. Find  $\lim_{x \rightarrow -1} \frac{x^2 + 3x + 2}{x^2 + 4x + 3}$   
(a) does not exist    (b) 0    (c)  $\frac{3}{4}$     (d)  $\frac{1}{2}$     (e) none of these
8. If  $f(x) = 2x^2 + 3x$ , then  $f(x+h) =$   
(a)  $2(x^2 + h^2) + 3(x+h) + 2xh$     (b)  $2x^2 + 3x + h$     (c)  $2(x^2 + h) + 3(x+h)$   
(d)  $2(x^2 + h^2) + 3(x+h)$     (e) none of these
9. Find all the relative (local) maxima and minima of  $f(x) = x^3 + 11x^2 - 45x + 60$ .  
(a) Relative minimum at  $x = \frac{5}{3}$  and relative maximum at  $x = 9$   
(b) Relative minimum at  $x = 5$  and relative maximum at  $x = 3$   
(c) Relative minimum at  $x = 4$  and relative maximum at  $x = 15$   
(d) Relative minimum at  $x = 5$  and relative maximum at  $x = 11$   
(e) None of these
10. Simplify  $4^{-1} + 4^{-2}$   
(a)  $\frac{1}{4}$     (b)  $4^{-3}$     (c)  $\frac{5}{16}$     (d) 20    (e) none of these