FINAL EXAMINATION
MATHEMATICS 914
APPLIED MATHEMATICS – BUSINESS ADMINISTRATION

December 12, 2005   **2:00-5:00 P.M.**

STUDENT NAME: _____

EXAMINERS: M. PERL, S. KENGATHARAM

INSTRUCTIONS
- **Non-programmable calculators are permitted.**
- **A formula sheet is provided.**
- **SHOW ALL WORK. No marks will be given for trial and error or guess and check.**

Question #	Out of	Mark
1	8	
2	16	
3	4	
4	8	
5	4	
6	8	
7	8	
8	8	
9	4	
10	4	
11	4	
12	4	
13	4	
14	4	
15	6	
16	6	

1. Simplify:

   i) $\dfrac{3x}{x^2-4} - \dfrac{1}{x^2+4x+4}$

   ii) $\left(\dfrac{2x^4 y^{10}}{3^{-1} x^{-2} y^5}\right)^{-2}$

2. Solve the following equations.

   i) $\dfrac{3x+1}{2} + \dfrac{5x-3}{6} = \dfrac{20x+3}{9}$

   ii) $\begin{cases} 2x+3y & = & 9 \\ 5x-2y & = & -25 \end{cases}$

   iii) $3^x = 1000$ (Answer to 3 decimal places.)

   iv) $3x^2 - 7x = -2$

3. If $f(x) = 3x^2 - 2x - 5$, find the difference quotient $\dfrac{f(x+h) - f(x)}{h}$.

4. If $f(x) = 2x^2 - x - 1$ and $g(x) = 2x + 1$

   i) Find $\dfrac{f(x)}{g(x)}$

   $\left[\text{i.e. Divide } 2x^2 - x - 1 \text{ by } 2x + 1\right]$

   ii) Find $(f \circ g)(1)$.

5. Consider the function $y = 2^{x+1}$. Complete the following table and sketch the graph clearly labeling the points in the table.

$x =$	-2	-1	0	1	2	3
$y =$						

6.　　i)　　Rewrite as the sum and/or difference of simple logarithms.

$$\log_3\left(\frac{x^2\sqrt{y}}{z^3}\right)$$

　　　　ii)　　 <u>Graph</u>　$y = \log_4 x$. (Use table of values.)

7.　　Write the equation of the line passing through the point $(-2, -7)$ that is perpendicular to the line given by the equation $3x + 5y = 11$.

8.　　The demand function for an item is given by $p = 300 - 0.1x$ where x represents the number of units.
　　　　i)　　Find the revenue function, $R(x)$.
　　　　ii)　　At what price will the revenue function be maximized.

9.　　A company's supply function is given by $p = q^2 + q + 40$. The company's corresponding demand function is given by $p = -3q + 100$. Find the equilibrium price and quantity.

10.　　You invest $5000 at simple interest for 10 years. If your investment is worth $9000 find the rate of interest.

11.　　If you deposit $3000 in a bank that pays interest at 7% compounded monthly. Find the accumulated value after 8 years.

12.　　How long will it take for $12000 invested at 6.5% compounded continuously to accumulate to $20000.

13.　　 A company offered an annuity that pays 6.65% compounded quarterly if $2500 is deposited into this annuity at the end of every 3 months. How much is in the account after 10 years?

14.　　An inheritance of $450,000 will provide how much at the end of each year, for the next 20 years, if money is worth 7% compounded annually?

15.　　A company orders $305,000 worth of merchandise and receives a series discount of 30/15/10.
　　　　Find:　i) the net price.
　　　　　　　 ii) the total discount.

16.　　An item sells for $104. There is a markup rate of 30% based on selling price.
　　　　Find:　i) the cost price.
　　　　　　　 ii) the mark up.

FORMULAE

1) If $ax^2 + bx + c = 0$; $x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

2) $A(or\ S) = P + \Pr t = P(1 + rt)$

3) $A(or\ S) = P\left[1 + \frac{r}{m}\right]^{mt} = P(1 + i)^n$

4) $A(or\ S) = Pe^{rt}$

5) $S = \dfrac{R\left[(1 + i)^n - 1\right]}{i}$

   or $S = \dfrac{R\left[\left(1 + \frac{r}{m}\right)^{mt} - 1\right]}{\frac{r}{m}}$

6) $A = R\left[1 - (1 + i)^{-n}\right]\Big/ i$

   or $A = R\left[1 - \left(1 + \frac{r}{m}\right)^{-mt}\right]\Big/ \frac{r}{m}$

7) $M = S - C$

8) $r = \dfrac{M}{C}$

9) $r = \dfrac{M}{S}$

10) $S = (1 + r)C$

11) $C = (1 - r)S$

12) $S = (1 - r)R$

13) Discount = list price × discount rate

14) Discount = list price – net price