FINAL EXAMINATION
MATHEMATICS 914
APPLIED MATHEMATICS – BUSINESS ADMINISTRATION

December 16, 2004 **2:00-5:00 P.M.**

STUDENT NAME: _____

EXAMINERS: M. PERL, H. GREENSPAN

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) $\dfrac{x}{x^2-9}+\dfrac{x+2}{x+3}-\dfrac{2x}{x+3}$ Ans. $=\dfrac{-x^2-6x-6}{x^2-9}$

ii) $\left(\dfrac{2x^{-1}}{x^3z^{-2}}\right)^{-2}$ Ans. $=\dfrac{x^8}{4z^4}$

2. Solve the following equations.

i) $\dfrac{2x-2}{3}-\dfrac{x+3}{5}=\dfrac{x+23}{15}$ Ans. $x=7$

ii) $\begin{cases}3x-4y &= 25\\ 2x+7y &= -22\end{cases}$ Ans. $\begin{matrix}x= 3\\ y=-4\end{matrix}$

iii) $4^x=1250$ (Answer to 3 decimal places.) Ans. 5.144

iv) $x^2-20=x$ Ans. $x=5,\quad x=-4$

3. If $f(x)=-2x^2+3x-1$, find the difference quotient $\dfrac{f(x+h)-f(x)}{h}$.

Ans. $-4x-2h+3$

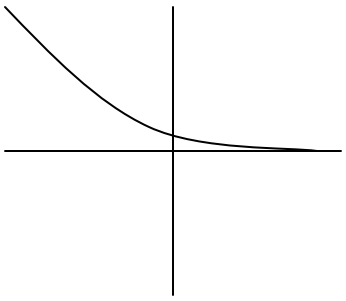
4. If $f(x)=2x^2-x$ and $g(x)=3x+1$

i) evaluate $\dfrac{f(-5)}{g(2)}$ Ans. $\dfrac{55}{7}$

ii) find $(fog)(x)$ and simplify your answer. Ans. $18x^2+9x-1$

5. Consider the function $y = f(x) = 2^{-x}$. Complete the following table and sketch the graph clearly labeling the points in the table.

$x =$	-2	-1	0	1	2	3
$y =$	4	2	1	.5	.25	.125



6. i) Rewrite $\log_2\left(\frac{x^3y^2}{\sqrt{z}}\right)$ as the sum and/or difference of simple logarithms. Ans. $3\log_2 x + 2\log_2 y - \frac{1}{2}\log_2 z$

ii) Evaluate $\log_2\left(\frac{64}{4}\right)$. Ans. $= 4$

7. The cost of producing 25 items is \$180 and the cost of producing 45 items is \$280. Assuming your costs are <u>linear</u>

i) find $C(x)$ the cost function. Ans. $5x + 55$

ii) find the cost of producing 100 items. Ans. \$555

8. The demand function for an item is given by $p = 504 - 6(x - 2)$ where x represents the number of units.

i) Find the revenue function, $R(x)$. Ans. $516x - 6x^2$

ii) At what price will the revenue function be maximized. Ans. \$11094

9. A company's supply function is given by $5p + 2q = 250$. The company's corresponding demand function is given by $41p - 3q = 110$. Find the equilibrium price and quantity. Ans. $p = 10$
$q = 100$

10. You invest $50000 at simple interest for 72 months. If your investment is worth $80000. Find the rate of interest. Ans. 10%

11. If you deposit $4500 in a bank that pays interest at 6% compounded monthly. Find the accumulated value after 6 years. Ans. $6444.20

12. How long will it take for $15000 invested at 5.5% compounded continuously to accumulate to $25000. Ans. 9.3 years

13. A company offered an annuity that pays 6.95% compounded quarterly if $2800 is deposited into this annuity at the end of every 3 months. How much is in the account after 10 years? Ans. $159597.59

14. A couple inherits $100000. How much can this generate at the beginning of each month over the next 6 years, if money is worth 6% compounded monthly? Ans. $1657.29

15. A company orders $105000 worth of merchandise and receives a series discount of 20/12/5.
    Find: i) the net price. Ans. $70224
    ii) the total discount. Ans. $34776

16. An item sells for $95. There is a markup rate of 25% based on cost.
    Find: i) the cost price. Ans. $76
    ii) the mark up. Ans. $19

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) $r = \frac{M}{C}$

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

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

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

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

13) Discount = list price $\times$ discount rate

14) Discount = list price $-$ net price