Prince Sultan University
MATH 211
Final Exam
First Semester 2009/2010, Term 091
Saturday, January 30, 2010

Time Allowed: 120 minutes (2 hours)

Name: _____ _____ _____
(First) (Middle) (Last)

ID Number: _____ Instructor: _____

- You may use CASIO scientific calculator that does not have programming or graphing capabilities.
- You may **NOT borrow** a calculator from anyone.
- There should be **NO talking** during the examination.
- Your exam will be taken **immediately** without any warning if your mobile is seen or heard
- You must show all your work beside the problem. Be organized.
- You may use the back of the pages for extra space, but indicate that on the page with the problem.
- This examination has **11** problems, some with several parts. Make sure that your paper has all these problems

Problems	Max points	Student's Points
1,2,3	16	
4,5	16	
6,7	18	
8,9	16	
10,11	14	
Total	80	
Total	40	

1) [4 points] Given that $2^y + \log_3 x = 5$, find $\frac{dy}{dx}$.

2) [6 points] The demand function for a particular commodity is $q = 3000e^{-0.04p}$, given in terms of price *p* per unit at which all *q* units can be sold.
Find the elasticity of demand and determine the values of *p* for which the demand is elastic, inelastic or of unit elasticity.

3) [6 points] A manufacturer estimates that when *x* units of a particular commodity are produced, the total cost will be $C(x) = 150 + 25\ln(5x - 2)$ dollars. Use marginal cost analysis to estimate the cost of producing the 10^{th} unit.

4) [10 points] Given the function $\frac{2x}{x-1}$:

a) Determine the vertical and horizontal asymptotes of the graph.

b) Find the *x* and *y* intercepts.

c) Find $f'(x)$ and use it to determine the critical numbers (if any) and the intervals of increase and decrease.

d) Find $f''(x)$ and use it to determine intervals of concavity.

e) Sketch the graph, showing all the key coordinates.

5) [6 points] Find the area of the region bounded by curve $y = x^2 - 6x + 8$ and the curve $y = -x^2 + 4x$.

6) [6 points] Records indicate that t months after the beginning of the year, the price of rice was $P(t) = t^2 + 3t + 1.6$ dollars per kilo. What was the **average** price of rice per kilo during the first 4 months of the year?

7) [12 points] A manufacturer estimates that q thousand sneakers will be purchased (demanded) by wholesalers when the price is $p = D(q) = -0.3q^2 + 70$ dollars per sneaker and the same number of sneakers will be supplied when the price is $p = S(q) = 0.1q^2 + q + 20$ dollars per sneaker.

a) Find the equilibrium price and the quantity demanded at that price.

b) Determine the consumers' surplus.

c) Determine the producers' surplus.

8) [12 points] Find the following integrals

a) $\int_0^1 \left(x^3 + x\right)\sqrt{x^4 + 2x^2 + 1}\, dx$

b) $\int_0^2 \frac{x}{\sqrt{4x+1}}\, dx$

c) $\int \left(3 - 2x\right) e^{-x}\, dx$

9) [4 points] Describe the domain of the function $f\left(x, y\right) = \frac{\ln xy}{\sqrt{x - 2y}}$

10) [6 points] Given that $f(x,y)=5x^2y+e^{xy}+3$, evaluate the partial derivatives f_{xx}, f_{xy}, f_{yy} and f_{yx}

11) [8 points] The productivity of France is given by $Q(K,L)=90K^{\frac{1}{3}}L^{\frac{2}{3}}$ units where K is the capital expenditure (in millions of francs) and L is the size of the labor force (in thousands of worker hours).

a) Find the marginal productivity of capital Q_K and the marginal productivity of labor Q_L when capital expenditure is 5495 million francs ($K=5495$) and the labor level is 4,587,000 ($L=4587$) worker hours.

b) Should the French government encourage capital investment or additional labor employment to increase productivity as quickly as possible?

END OF EXAM