Prince Sultan University

Math 211
Major Exam I
Second Semester, Term 132
Tuesday, March 11, 2013

Time Allowed: 90 minutes

Student Name:_____ _____ _____

Student ID #: _____

Serial Class #:_____ Section #: 225

Instructor's Name: Dr. Aiman Mukheimer

Important Instructions:

1. You may use a scientific calculator that does not have programming or graphing capabilities.
2. You may NOT borrow a calculator from anyone.
3. You may NOT use notes or any textbook.
4. Talking during the examination is NOT allowed.
5. Your exam will be taken immediately if your mobile phone is seen or heard.
6. Looking around or making an attempt to cheat will result in your exam being cancelled.
7. This examination has 15 problems, some with several parts. Make sure your paper has all these problems.

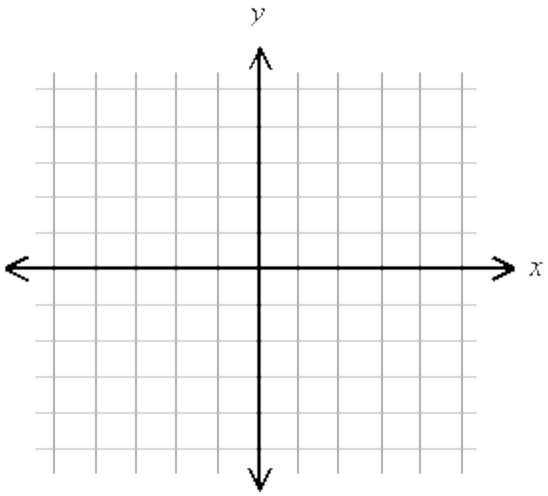
Problems	Max points	Student's Points
1,2,3,4	15	
5,6,7,8	15	
9,10,11	15	
12,13,14,15	15	
Total	60	

Q1. (2 points) What is the domain of the function $f(t)=\dfrac{t+15}{t^2-t-2}$?

Q2. (4 points) Write an equation for the line that passes through $(\dfrac{-1}{2},1)$ and perpendicular to the line $2x+5y=3$.

Q3. (5 points) A manufacturer's total cost consists of a fixed overhead of \$5000 plus production cost of \$60 per unit.

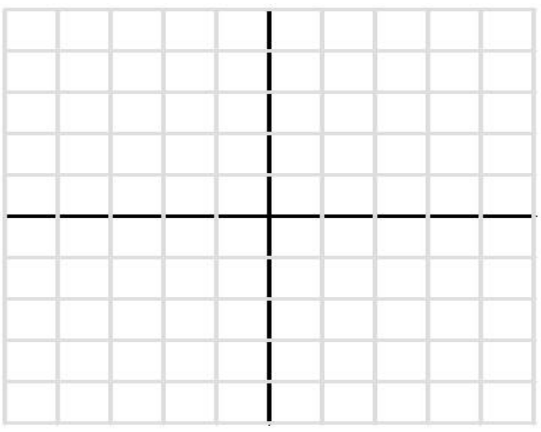
a) Express the total cost as function of the number of units produced, and sketch its graph.



b) Find the average cost function. What is the average cost of producing 20 units?

Q4. (4 points) Graph the function

$$f(x)=\begin{cases} x^2+x-3 & \text{if } x<1 \\ 1-2x & \text{if } x\geq 1 \end{cases}$$



Q5. (5 point) Find the limit if it exists:

1. $\lim_{x\to 5}\dfrac{x^2-3x-10}{x-5}$

2. $\lim_{x\to\infty}\dfrac{7x^2-x-6}{21-5x^2}$

3. $\lim_{x\to 2}(2-\dfrac{1}{x})$

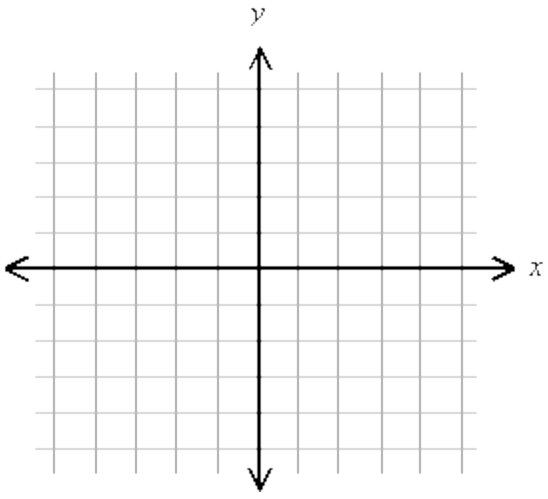
Q6. (2 points) List all values of x for which the function $g(x)=\dfrac{x^3+5x}{(x-2)(2x+3)}$ is not continuous.

Q7. (3 points) Find the values of the constant *A* such that the function *f*(*x*) continuous for all *x*.

$$f(x)=\begin{cases} Ax-3 & if \quad x<2 \\ 3-x+2x^2 & if \quad x\geq 2 \end{cases}$$

Q8. (5 points) Producers will supply x units of a certain commodity to the market when the price is $p=S(x)$ dollars per unit, and consumers will demand (buy) x units when the price is $p=D(x)$ dollars per unit, where $S(x)=x+3$ and $D(x)=\dfrac{24}{x+1}$

a) Find the equilibrium level x_e **<u>and</u>** the equilibrium price p_e.



b) Draw the supply and demand curves on the same graph.

Q9. (3 point) After t months, the production output at a certain factory is $N(t)$ thousand units, where $N(t)=\sqrt{t^2+3t+6}$. At what rate is the production level changing after 2 months? Is production increasing or decreasing at this time?

Q10. (3 points) Find $h'(-1)$ if $h(x)=\dfrac{x^3+xg(x)}{3x-5}$ where $g(-1)=0$ and $g'(-1)=1$.

Q11. (9 points) Differentiate the following functions:

1. $f(x)=\dfrac{2}{3}x^6-\dfrac{9x}{6}+\dfrac{8}{3x^4}+\sqrt[5]{x^8}+\dfrac{\sqrt{7}}{3}$

2. $f(x)=\sqrt{\dfrac{4+x^3-x^5}{x^3}}$

3. $f(x)=\dfrac{4+x^2}{x^7+1}$

Q12. (4 points) Find the third derivative of $f(x) = (4x^4 + 2x + 5)(3 - x^3)$.

Q13. (4 points) When the price of a certain commodity is p dollars per unit, the manufacturer is willing to supply x hundred units, where $3p^2 - x^2 = 12$. How fast is the supply changing when the price is \$4 per unit and is increasing at the rate of 87 cents per month?

Q14. (3 points) The gross national product (GNP) of a certain country is $N(t) = 2t^2 + 3t + 12$ billion dollars where *t* is the number of years after 2001.

a) At what rate were the gross national products (GNP) changing with respect to time in 2013?

b) At what percentage rate will the GNP be changing with respect to time in 2013?

Q15. (4 points) Find the equation of the line that is tangent to the curve $x^2y^3 - 2xy = 6x + y + 1$ at (0, –1).