Prince Sultan University
Department of Mathematical Sciences

MATH 001
Final Examination
Semester I, Term 141
Tuesday, January 06, 2014
Time Allowed: 120 minutes

Student Name: _____

Student ID #: _____ Section_____

Instructor's Name _____ Class Time_____

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. There should be NO talking during the examination.
5. If your mobile phone is seen or heard, your exam will be taken immediately.
6. You must show all your work beside the problem. Be organized.
7. You may use the back of the pages for extra space, but be sure to indicate that on the page with the problem.
8. This examination has 16 problems. Make sure your paper has all these problems.

Problems	Max points	Student's Points
1 , 2 , 3	18	
4,5,6	19	
7,8	15	
9,10,11	19	
12,13	13	
14,15,16	16	
Total	**100**	

Q.1 (2+2+3 points) Factor and simplify each of the following completely

a. $(x-3)^{\frac{-1}{3}}+(x-3)^{-\frac{4}{3}}$

b. $81y^4-16$

c. $5x^3+x^2-x-5$

Q.2 (4+3 points) Simplify the following as much as possible:

a. $3\sqrt{5a^2}-6\sqrt{125a^2}+10\sqrt{500a^2}$

b. $\left(\dfrac{30x^2y^{\frac{1}{2}}z^2}{5x^3y^{\frac{-1}{3}}z^{-2}}\right)^2$

Q.3 (4 points) Simplify $\dfrac{4+i}{3+\sqrt{-25}}$ write the result in <u>standard form</u>. (Show all your steps)

Q.5 (4 points) Find the equation of a line that has an *x*-intercept of 3 and is parallel to $\frac{3}{2}x+4y=12$

Q.6 (8 points) Given functions $f(x)=x+4$ and $g(x)=\frac{7}{x+5}$, find:

a. $(g\circ f)(-1)$

b. The value of *x* for which $(f\circ g)(x)=(g\circ f)(x)$

c. The domain of $(g\circ f)(x)$

Q.7 (2+2+3 points) Perform the indicated operations and **<u>simplify</u>** each of the following:

a. $\left(3x^2y+5y^3\right)\left(3xy-5x\right)$

b. $\left(8a^2b^3-3ab-4b\right)-\left(2a^2b^3-ba-12b\right)$

c. $\frac{x^2+5x+6}{x^2+9x+14}\div\frac{x^2-9}{x^2-x-56}$

Q.7 (4+3+4 points) Solve each of the following equations:

a. $\frac{3}{x-7}+\frac{1}{x+6}=\frac{5}{x^2-x-42}$

b. $\sqrt{2x+6}+4=2x-2$

c. $-3+7x^2+12x=0$ (use the Quadratic Formula)

Q.8 (4 points) Given the function: $f(x)=\frac{2}{5}x+\frac{1}{3}$. Find the inverse of $f(x)$.

Q.9 (5 points) Find the midpoint of the line segment that joins the point $(3,-1)$ and the center of the circle whose equation is: $x^2+y^2-6x+10y-30=0$

Q.10 (5 points) Begin by graphing the function $f(x)=x^3$, then use **transformations** of this graph to graph the function $g(x)=-2(x-1)^3+3$. **(Show all the steps)**

Q.11 (4+5 points) Solve each of the following inequalities and graph the solution set on a number line. Express the solution set using interval notation.

a. $\dfrac{x-3}{x+1}-\dfrac{1}{3}\geq-\dfrac{2}{3}$

b. $11|5x-10|-2\leq 20$

Q.12 (7 points) Consider the quadratic function $f(x) = -2(x+4)^2 + 10$

a. Find the coordinates of the vertex.

b. Sketch the graph of f (Show the x and y intercepts , if any).

c. Determine the function's Range.

Q.13 (6 points) Use the graph to determine

a) The domain of f

b) The range of f

c) The $x-$ intercept(s)

d) The intervals on which f is increasing

e) The value of $f(-6)$

f) Whether f is even, odd, or neither? (Give the reason for your answer)

Q.14 (6 points) Find a 4^{th} degree polynomial function with real coefficients that has the zeros: $1,\ -1$ and $-2i$; and $f(2)=72$.

Q.15 (5 points) Solve the equation $x^3+5x^2-2x-24=0$ given that that 2 is a solution of this equation.

Q.16 (5 points) Given the function $f(x)=4x^2(x-2)^4(x-1)^5$

a. Use the Leading Coefficient Test to determine the end behavior of the graph.

b. Find the *x*-**intercepts** and their **Multiplicity** and write what happens at each intercept. **Do not graph the function.**