Prince Sultan University
Orientation Mathematics Program
MATH 001
Final Examination
Term 082
Thursday, June 18, 2009
Time Allowed: 150 minutes

Student Name: _____

Student ID #: _____ Section #: _____

Teacher's Name: _____

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. There should be NO talking during the examination.
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 16 problems, some with several parts. Make sure your paper has all these problems.

Problems	Max points	Student's Points
1,2,3	18	
4,5,6	20	
7,8,9	17	
10,11,12	17	
13,14	14	
1516	14	
Total	100	

Q1. (6 points) Simplify each of the following with positive powers:

(i) $3(7x-5y)-2(4y-x+1)$

(ii) $\left(\frac{\sqrt[3]{y^9}\sqrt{x^{18}}}{8y^{-3}x^{-6}}\right)^{\frac{1}{3}}$

Q2. (4 points) Find all values of x satisfying the following conditions:

$Y_1=\frac{x-4}{3}$, $Y_2=\frac{x-9}{4}$, and $Y_1-Y_2=1$

Q3. (8 points) Let $f(x)=\begin{cases}x^2-2 & x<1\\ x+2 & x\geq 1\end{cases}$ and $g(x)=\sqrt{x-1}$,find

(i) $f(1)$ and $f(-3)$

(ii) $(g\circ f)(3)$

(iii) $(g\circ g)(x)$

Q4. (12 points) Perform the indicated operations and simplify. ***Show all your steps***

(i) $\dfrac{4}{x^2+x-2}+\dfrac{1}{x^2+5x+6}$

(ii) $\dfrac{9}{2-i}$

(iii) $(4-3i)(2-i)^2$

(iv) $\left(3x^2-2\right)^2$

Q5. (3 points) Write the standard form of the equation of the circle with center $(2,-3)$ and radius 4.

Q6. (5 points) Write the equation of the line that has x-intercept 5 and perpendicular to the line $3x+2y=6$

Q7. (4 points) Use synthetic division to divide $x^4+8x^3-9x^2+10x+100$ by $x+9$
Write the quotient and the remainder.

Q8. (4 points) Let $f(x)=\dfrac{x^2-3}{2x}$

(i) Is $f(x)$ even, odd, or neither? Explain.

(ii) Is $f(x)$ symmetric on $x-axis$, $y-axis$, *origin*, or *neither*? Explain.

Q9. (9 points) Solve each of the following equations:

(i) $\dfrac{4}{x}=\dfrac{5}{2x}+3$

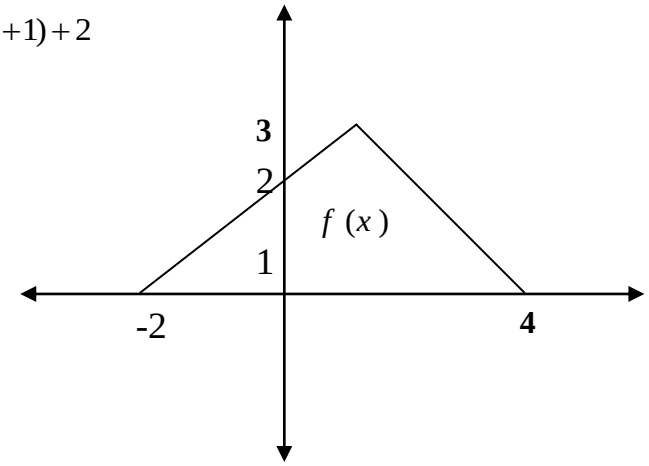
(ii) $2|2x-1|+6=2$

(iii) $3x^2-12x+12=0$

Q10. (6 points) Use the graph of the function $f(x)$ given below to answer the following questions.

(i) Determine the domain and range of $f(x)$

(ii) Sketch the graph of $g(x) = -f(x+1) + 2$ on the same coordinates.



Q11. (6 points) Let $f(x) = 2x - 1$.

(i) Show that the function $g(x) = \frac{1}{2}x - 1$ is ***not*** inverse of *f*(*x*).

(ii) Find the inverse function, $f^{-1}(x)$, of *f(x)*.

Q12 (5 points) Find a 4^{th} degree polynomial function with real coefficients that has the zeros: 0 (multiplicity 2) and $-2i$ and $f(2) = -32$

Q13 (6 points) Solve each inequality and graph the solution set on a real number line.

(i) $\frac{x}{x-2} \geq 2$

(ii) $|2x-6| \leq 0$

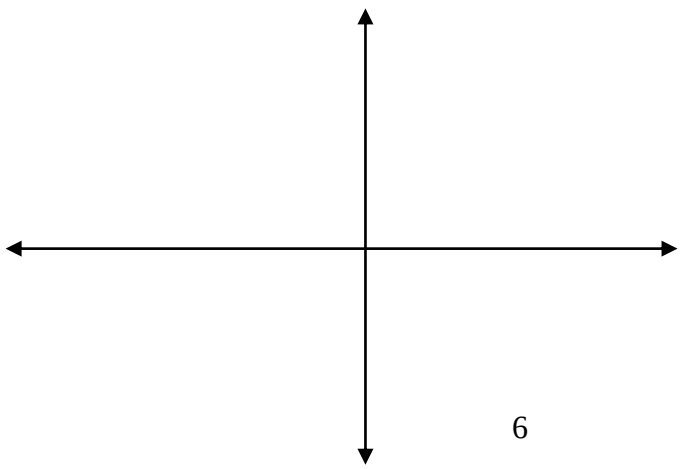
Q14. (8 points) Consider the polynomial function, $p(x) = x^3(x-1)(x+2)^2$

(i) Determine the degree of the polynomial

(ii) Determine the graph's end behavior

(iii) Find the zeros of $p(x)$ and give the multiplicity of each zero. State whether the graph crosses or touches the $x-axis$ at each zero

(iv) Sketch the graph of $p(x)$



Q15. (6 points) Given that 2 is a zero of $f(x) = 2x^3 + x^2 - 13x + 6$. Solve the equation: $2x^3 + x^2 - 13x + 6 = 0$ (Show all your steps)

16. (8 points) Let $f(x) = \dfrac{x^2}{x^2 - 1}$.

(i) Find the domain of $f(x)$.

(ii) Find the *x*-intercepts and the *y*-intercepts (if any).

(iii) Find the horizontal and vertical asymptotes of $f(x)$.

(iv) Graph $f(x)$.