

PRINCE SULTAN UNIVERSITY

Department of Mathematical Sciences

MATH 001 Final Examination

Saturday, 3 June 2006

(052)

Time allowed: 150 minutes

Student Name: _____

Student ID number: _____

Section: _____

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 18 problems, some with several parts. Make sure your paper has all these problems.

Problems	Max points	Student's Points
1,2	12	
3,4,5	14	
6,7	13	
8,9,10	13	
11,12,13	17	
14,15,16	18	
17,18	13	
Total	100	

1. (6 points) Simplify as much as possible:

(i) $\frac{\sqrt{150x^3}}{\sqrt{2x}}$

(ii) $\frac{7}{5 + \sqrt{3}}$

2. (6 points) Factor completely

(i) $12x^2y - 27y - 4x^2 + 9$

(ii) $(x + 5)^{-1/2} - (x + 5)^{1/2}$

3. (6 points) Perform the indicated operations and write the result in standard form

(i) $\frac{2+3i}{2+i}$

(ii) $(-5-\sqrt{-9})^2$

4. (4 points) Solve the inequality: $-6 \leq \frac{1}{2}x - 4 < -3$ Express the answer in interval notation, and sketch the solution on a real number line.

5. (4 points) Find the domain of the function $f(x) = \sqrt{x^2 - 5x - 24}$. Express the domain using interval notation.

6. (9 points) Solve each of the following equations:

(i) $(x+5)^{2/3} = 4$

(ii) $x^2 - 4x + 29 = 0$

(iii) $\frac{1}{x-1} = \frac{1}{(2x+3)(x-1)} + \frac{4}{2x+3}$

7. (4 points) Find the center and radius of the circle whose equation is:

$$x^2 + y^2 - 6y - 7 = 0$$

8. (5 points) Given $f(x) = 9 - x^2$ and $g(x) = \sqrt{x^2 - 9}$.

i) Find $(f \circ g)(x)$ and simplify.

ii) Find $(g \circ f)(2)$.

9. (4 points) Find $f^{-1}(x)$, if $f(x) = \frac{2x+1}{x-3}$.

10. (4 points) Determine whether $f(x) = \frac{1}{5}x^6 - 3x^2$ is even; odd; or neither.

11. (8 points) Let $f(x) = 5 - 4x - x^2$

(i) Find the coordinates of the vertex.

(ii) Write the equation of the parabola's axis of symmetry.

(iii) Determine whether the parabola has a maximum or minimum value.

(iv) Find the coordinates of the minimum or the maximum point.

12. (6 points) Write the equation of the line passing through $(5, -9)$ and perpendicular to the line whose equation is $x + 7y - 12 = 0$.

13. (3 points) Find the domain of $g(x) = \frac{2x^2}{(x-2)(x+6)}$

14. (6 points) Find the zeros of $f(x) = x^3 + 4x^2 + 4x$ and give the multiplicity of each zero. State whether the graph crosses the x-axis, or touches the x-axis and turns around, at each zero.
15. (6 points) Divide $\frac{x^7 - 128}{x - 2}$ using synthetic division. Write the quotient and the remainder.
16. (6 points) Find a 4th-degree polynomial function $f(x)$ with real coefficients that has i is a zero; -3 is a zero of multiplicity 2, and such that $f(-1) = 16$.

17. (6 points) Find all solutions of the equation $12x^3 + 16x^2 - 5x - 3 = 0$ given that $-\frac{3}{2}$ is a root.

18. (7 points) Graph: $f(x) = \frac{2x}{x-1}$.