FINAL EXAM

Mathematics 1320/1420, Spring 2015

Group A

Name:

Follow the instructions given to you by your instructor. The test consists of 18 multiple choice problems for which mark your answers on the scantron and 4 problems to be worked out completely in the bluebook. Each multiple choice question is worth 1 point and the open questions are 2 points each. Two out of the four open questions are bonus questions.

1. Divide and express the result in standard form.

$$\frac{10i}{3+i}$$

a) $-1+3i$
b) $1+10i$
c) $1-3i$
d) $1+3i$

2. Solve the equation.

$$\frac{4x}{5}-x=\frac{x}{45}-\frac{2}{9}$$

a) $\{-1\}$
b) $\{1\}$
c) $\left\{-\frac{5}{4}\right\}$
d) $\left\{\frac{5}{4}\right\}$

3. Solve the polynomial equation.

$$12x^3+84x^2+120x=0$$

a) $\{0,-5,-2\}$
b) $\{0,2,5\}$
c) $\left\{-2,-\frac{1}{5}\right\}$
d) $\{-5,-2\}$

4. Solve the absolute value equation or indicate that the equation has no solution.

$$3|x-3|-5=13$$

a) $\{3\}$
b) $\{-3,9\}$
c) $\{-9,3\}$
d) $\emptyset\ (no\ solution)$

5. Find the domain of the function.

$$f(x) = \frac{3x}{x+9}$$

a) $(-\infty, \infty)$
b) $(-\infty, 0) \cup (0, \infty)$
c) $(-\infty, -9) \cup (-9, \infty)$
d) $(-\infty, -9) \cup (-9, 0) \cup (0, \infty)$

6. For the given functions *f* and *g*, find the composition $f\big(g(5)\big)$.

$$f(x) = x^2 + 2x + 3, \quad g(x) = x^2 + 2x - 2$$

a) 1,168
b) 1,513
c) 1,523
d) 1,158

7. For the given function find the vertex and determine if the function has min. or max.

$$f(x) = -2x - 8 + x^2$$

a) Minimum, vertex at (-1, -9)
b) Maximum, vertex at (1, 9)
c) Maximum, vertex at (-1, 9)
d) Minimum, vertex at (1, -9)

8. Find the degree of the polynomial function.

$$f(x) = -5x + 7x^5$$

a) 5
b) -5
c) 7
d) 1

9. Find the 4-th degree polynomial function with leading coefficient 1 and zeros; *- 4, 4* and *2i*.

a) $f(x) = x^4 + 4x^3 - 12x^2 - 64$
b) $f(x) = x^4 + 4x^2 - 4x - 64$
c) $f(x) = x^4 + 4x^2 - 64$
d) $f(x) = x^4 - 12x^2 - 64$

10. Solve the rational inequality and express the solution set in interval notation.

$$\frac{x-7}{x+8} > 0$$

a) $(-\infty, -8)\ or\ (7, \infty)$
b) $(-\infty, -8)$
c) $(7, \infty)$
d) $(-8, 7)$

11. Write the equation in its equivalent logarithmic form.

$$5^2 = 25$$

a) $log_5 25 = 2$
b) $log_{25} 5 = 2$
c) $log_2 25 = 5$
d) $log_5 2 = 25$

12. Solve the logarithmic equation.

$$log 4x = log 5 + \log(x - 4)$$

a) $\{20\}$
b) $\{-20\}$
c) $\left\{\frac{20}{9}\right\}$
d) $\left\{-\frac{20}{9}\right\}$

13. Solve the system by the addition method.

$$\begin{cases} 5x + 4y = 39 \\ 5x + 2y = 47 \end{cases}$$

a) $\{(-11, -4)\}$
b) $\{(-11, 4)\}$
c) $\{(-4, 11)\}$
d) $\{(11, -4)\}$

14. Find the product AB, if possible.

$$A = \begin{bmatrix} -1 & 3 \\ 5 & 2 \end{bmatrix}, \quad B = \begin{bmatrix} 0 & -2 & 5 \\ 1 & -3 & 2 \end{bmatrix}$$

a) AB is not defined

b) $\begin{bmatrix} 3 & 2 \\ -7 & -16 \\ 1 & 29 \end{bmatrix}$

c) $\begin{bmatrix} 3 & -7 & 1 \\ 2 & -16 & 29 \end{bmatrix}$

d) $\begin{bmatrix} 0 & -6 & 15 \\ 5 & -6 & 4 \end{bmatrix}$

15. Write the system of linear equations as an augmented matrix.

$$\begin{cases} 17x - 12y + 11z = -24 \\ -14x + 16y + 14z = 15 \\ 29x - 7y - 23z = -16 \end{cases}$$

a) $\left[\begin{array}{ccc|c} 17 & -12 & -24 & 11 \\ -14 & 16 & 15 & 14 \\ 29 & -7 & -16 & -23 \end{array}\right]$

b) $\left[\begin{array}{ccc|c} 17 & -14 & 29 & -24 \\ -12 & 16 & -7 & 15 \\ 11 & 14 & -23 & -16 \end{array}\right]$

c) $\left[\begin{array}{ccc|c} 17 & 12 & 11 & -24 \\ -14 & 16 & 14 & 15 \\ 29 & 7 & 23 & -16 \end{array}\right]$

d) $\left[\begin{array}{ccc|c} 17 & -12 & 11 & -24 \\ -14 & 16 & 14 & 15 \\ 29 & -7 & -23 & -16 \end{array}\right]$

16. Evaluate the function at the given value of the independent variable and simplify.

$$f(x) = x^2 + 2; \quad f(x+4)$$

a) $x^2 + 6$
b) $x^2 + 8x + 16$
c) $x^2 + 8x + 18$
d) $x^2 + 18$

17. Write the first four terms of the sequence whose general term is given.

$$a_n = \frac{5(n+1)!}{n!}$$

a) $10, 15, 20, 25$

b) $10, \frac{15}{2}, \frac{20}{3}, \frac{25}{4}$

c) $6, 7, 8, 9$

d) $10, \frac{15}{2}, \frac{10}{3}, \frac{25}{24}$

18. Find the sum of the infinite geometric series, if it exists, using the formula; $S = \frac{a_1}{1-r}$

$$-10, -5, -\frac{5}{2}, -\frac{5}{4} \ldots \ldots \ldots$$

a) -20
b) $-\frac{35}{2}$
c) 10
d) Does not exist

19. Choose the right formula and solve the problem.

$$A = P\left(1 + \frac{r}{n}\right)^{nt} \quad or \quad A = Pe^{rt}$$

If you put $3200 in a saving account that earns 2.5% interest per year compounded quarterly, how much would you expect to have in that account in 3 years?

20. A college bookstore marks up the price it pays the publisher for a book by 25%. If the selling price of a book is $79, how much did the bookstore pay for the book?

Bonus Questions:

21. A small company in Virginia Beach manufactures handcrafted surfboards.
The profit of selling x boards is given by

$$P(x) = 20{,}000 + 80x - 0.4x^2$$

a. How many boards should be made to maximize the profit?
b. What is the maximum profit?

22. In 2000 the world population was 6.1 billion and in 2005 the world population was 6.5 billion. Find relative growth rate (round to three decimal places) and determine what year the population will reach 9 billion.
Use the formula; $N = N_0 e^{rt}$