Math 110 Exam 4

April 2-8, 2015

Instructions:
- DO NOT WRITE on the exam.
- Choose the one choice that best completes the statement or answers the questions.
- Fill in the answer to each problem on your computer-scored answer sheet.
- There is no time limit.
- No books, notes, or calculators allowed.

1. What are the vertices of $4x^2 + 3y^2 + 8x - 6y = 2$?

a. $(1, -1 - \sqrt{3}), (1, -1 + \sqrt{3})$ b. $(-1, 1 + \sqrt{3}), (-1, 1 - \sqrt{3})$ c. $(-1, 4), (-1, -2)$

d. $\left(\frac{1}{2}, 1\right), \left(-\frac{5}{2}, 1\right)$ e. $\left(\frac{5}{2}, -1\right), \left(-\frac{1}{2}, -1\right)$ f. $\left(\frac{5}{4}, 1\right), \left(-\frac{13}{4}, 1\right)$

2. Which is a focus of $(x + 4)^2 - 9(y - 3)^2 = 9$?

a. $(4 - \sqrt{10}, -3)$ b. $\left(-4 + \sqrt{10}, 3\right)$ c. $(-4 + 2\sqrt{2}, 3)$ d. $(-1, -3)$ e. $(-4, -2)$

3. How many solutions does the system $\begin{cases} 3x - y = 7 \\ 9x - 3y = 21 \end{cases}$

a. Infinitely Many b. 1 c. 0 d. Insufficient information

4. Find value of y for the solution of $\begin{cases} x - y - z = 1 \\ 2x + 3y + z = 2 \\ 4x + 2y = 0 \end{cases}$

a. -3 b. 2 c. 6 d. 4.5 e. -10

5. Write out the partial fraction decomposition for $\frac{4x^2 + 3x - 7}{x^2(x+5)(x^2 - 2x + 3)^2}$. Do not solve for coefficients.

a. $\frac{A}{x} + \frac{B}{x^2} + \frac{C}{x+5} + \frac{Dx+E}{x^2 - 2x + 3}$

b. $\frac{A}{x} + \frac{B}{x^2} + \frac{C}{x+5} + \frac{Dx+E}{x^2 - 2x + 3} + \frac{Fx+G}{(x^2 - 2x + 3)^2}$

c. $\frac{A}{x^2} + \frac{B}{x+5} + \frac{Cx+D}{x^2 - 2x + 3} + \frac{Ex+F}{(x^2 - 2x + 3)^2}$

d. $\frac{A}{x} + \frac{B}{x^2} + \frac{C}{x+5} + \frac{Dx+E}{(x^2 - 2x + 3)^2}$

6. If $n(A \cup B) = 50$, $n(A \cap B) = 10$, and $n(B) = 20$, find $n(A)$.

a. 30   b. 10   c. 20   d. 40

7. Find the sum of $7 + 12 + 17 + \cdots + 102$.

a. 1090   b. 2071   c. 1092   d. 2080   e. None of the above.

8. What is the 18th term of the sequence $\{a_n\} = \left\{\frac{2n-3}{4n}\right\}$

a. $\frac{1}{2}$ b. $\frac{11}{24}$ c. $\frac{15}{72}$

d. $\frac{11}{12}$ e. $\frac{33}{4}$ f. $\frac{31}{72}$

9. Find the asymptotes of the hyperbola:

$$y^2 - 4y - 4x^2 + 8x = 4$$

a. $y = \frac{1}{4}x + \frac{9}{4}$ b. $y = 2x$ c. $y = \frac{1}{2}x + \frac{5}{2}$
$\quad y = -\frac{1}{4}x + \frac{7}{4}$ $y = -2x + 4$ $\quad y = -\frac{1}{2}x + \frac{3}{2}$

d. $y = -4x - 2$ e. $y = \sqrt{2}x - 5$ f. $y = \frac{\sqrt{2}}{4}x - \frac{3}{2}$
$\quad y = 4x + 6$ $\quad y = -\sqrt{2}x + 3$ $\quad y = -\frac{\sqrt{2}}{4}x - \frac{1}{2}$

10. Which type of conic section is $2x^2 + 3y^2 - 8x + 6y + 5 = 0$

a. Circle   b. Parabola   c. Ellipse   d. Hyperbola   e. Not a Conic

11. Write as a fraction

$$7.2727272727\ldots$$

a. $\dfrac{231}{33}$ b. $\dfrac{727}{99}$ c. $\dfrac{81}{11}$

d. $\dfrac{80}{11}$ e. $\dfrac{239}{33}$ f. None of the above.

12. Find the sum of the coordinates of the solution of the system of equations:

$$\begin{cases} 2x - 3y = -1 \\ 10x + y = 11 \end{cases}$$

a. $-\dfrac{23}{28}$ b. 11 c. $-\dfrac{4}{3}$ d. 0 e. 2

13. The partial fraction decomposition of $\dfrac{x+1}{x(x-2)}$ is $\dfrac{A}{x} + \dfrac{B}{(x-2)}$. Find the value of A.

a. $\dfrac{3}{4}$ b. $-\dfrac{7}{6}$ c. $-\dfrac{1}{2}$ d. $-\dfrac{3}{4}$ e. $-\dfrac{1}{6}$

14. Find the number of solutions of the system of equations:

$$\begin{cases} x^2 + y^2 = 4 \\ y = x^2 - 9 \end{cases}$$

a. 4 b. 3 c. 2 d. 1 e. 0

15. Find and simplify the sum of

$$\sum_{k=1}^{25} \left(\frac{2}{3}\right)^k$$

a. $\dfrac{2}{3}\left(1 - \left(\dfrac{2}{3}\right)^{25}\right)$ b. $\dfrac{25}{2}\left(\dfrac{2}{3} + \left(\dfrac{2}{3}\right)^{25}\right)$ c. $\dfrac{1}{1-\left(\frac{2}{3}\right)^{25}}$ d. $2\left(1 - \left(\dfrac{2}{3}\right)^{25}\right)$ e. 3

16. Find the largest x-value that is part of a solution of the system $\begin{cases} x^2 - 4y^2 + 7 = 0 \\ 3x^2 + y^2 = 31 \end{cases}$

    a. $\sqrt{11}$ b. 2   c. $\frac{51}{13}$ d. $\frac{119}{13}$ e. 3

17. Find the sum:

$$\sum_{k=1}^{25} 3k - 7$$

    a. 1775   b. 800   c. 2918   d. 150   e. 1600

18. If $A = \{1, 3, 5, 7, 9\}$, $B = \{1, 5, 6, 7\}$, and $C = \{1, 2, 4, 6, 8, 9\}$, what is $(A \cap B) \cup C$?

    a. {1,2,3,4,5,6,7,8,9}   b. {1}   c. {1,2,4,5,6,7,8,9}

    d. {3}   e. {1,6,9}   f. None of the above

19. Find the 5th term of the series $\{a_n\} = \left\{ \left(\frac{2}{3}\right)^n \right\}$

    a. $\frac{64}{729}$ b. $\frac{16}{243}$ c. $\frac{16}{81}$

    d. $\frac{32}{729}$ e. $\frac{32}{243}$ f. $\frac{64}{243}$

20. Assume $1^3 + 2^3 + 3^3 + \cdots + n^3 = \frac{1}{4}n^2(n+1)^2$ is true for all n. If $(n+1)^3$ and $(n+2)^3$ are added to the left side, what is the new value of the right side.

    a. $\frac{1}{4}(n+1)^2(n+3)^2$ b. $\frac{1}{4}n^2(n+2)^2$ c. $\frac{1}{4}(n+2)^2(n+3)^2$

    d. $\frac{1}{4}(n+1)^2(n+3)^2$ e. $\frac{1}{4}(n+1)^2(n+2)^2$ f. Not Enough Information

Key:

1   B
2   B
3   A
4   C
5   B
6   D
7   A
8   B
9   B
10 C
11 D
12 E
13 C
14 E
15 D
16 E
17 B
18 C
19 E
20 C