Math 110
Exam IV
Fall 2009
All Sections including Salt Lake Center

1. The equation $4x^2 + y^2 - 8x + 4y + 4 = 0$ is what type of conic section:

   (a) parabola
   (b) ellipse
   (c) hyperbola
   (d) circle
   (e) none of the above

2. What is the center of the ellipse given by the equation $x^2 + 3y^2 - 12y + 9 = 0$

   (a) $(0, 0)$
   (b) $(3, 0)$
   (c) $(0, 2)$
   (d) $(4, 5)$
   (e) none of the above

3. What are the asymptotes of the hyperbola given by the equation $\frac{x^2}{9} - \frac{y^2}{16} = 1$

   (a) $y = \pm\frac{16}{9}x$
   (b) $y = 2 \pm 9x$
   (c) $y = \pm\frac{3}{4}x$
   (d) $y = \pm\frac{4}{3}x$
   (e) none of the above

4. Find the equation of a parabola that opens up and goes through the points $(3, -1)$, $(2, 1)$, and $(0, 17)$

   (a) $y = 2x^2 - 12x + 17$
   (b) $y = x^2 + 3x - 1$
   (c) $y = 4x^2 + 2x + 1$
   (d) $y = x^2$
   (e) none of the above

5. Solve the system of equations $\begin{cases} 2x - y = -1 \\ x + \frac{1}{2}y = \frac{3}{2} \end{cases}$. Find the product $x \cdot y$.

   (a) 1
   (b) 2
   (c) 3
   (d) 4
   (e) No solution. The system is inconsistent.

6. Which expression should we use to find the partial fraction decomposition of $\frac{x^3-8}{x^2(x-1)^3}$?

   (a) $\frac{A}{x^2} + \frac{B}{(x-1)^3}$
   (b) $\frac{A}{x} + \frac{B}{x^2} + \frac{C}{(x-1)^3}$
   (c) $\frac{A}{x} + \frac{B}{x^2} + \frac{C}{x-1} + \frac{D}{(x-1)^2} + \frac{E}{(x-1)^3}$
   (d) $\frac{A}{x} + \frac{Bx}{x^2} + \frac{C}{x-1} + \frac{Dx}{(x-1)^2} + \frac{Ex^2}{(x-1)^3}$
   (e) none of the above

7. When finding the intersection of a parabola with a circle what is the maximum number of solutions we should expect?

   (a) 0
   (b) 1
   (c) 2
   (d) 3
   (e) 4
   (f) none of the above

8. How many solutions does the following system of equations have?

$$\begin{cases} y = x^2 + 1 \\ \frac{x^2}{4} + \frac{y^2}{9} = 1 \end{cases}$$

   (a) 0
   (b) 1
   (c) 2
   (d) 3
   (e) 4
   (f) none of the above

9. Solve the system of equations

$$\begin{cases} x - y = 6 \\ 2x - 3z = 16 \\ 2y + z = 4 \end{cases}$$

   Find x:

   (a) 8
   (b) 2
   (c) 3
   (d) 5
   (e) none of the above

10. What is the sum of the first five terms of the sequence defined by the recursive equations

$$s_1 = 1,\ s_n = 4s_{n-1}$$

   (a) 256
   (b) 341
   (c) 64
   (d) 85
   (e) 312
   (f) none of the above

11. Suppose you want to use induction to show that $1 + 3 + 5 + \cdots + (2n - 1) = n^2$. To check CONDITON II for mathematical induction we must first suppose that the statement is true for $n = k$ and then show

   (a) it is also true for $n = k + 1$.
   (b) it is also true for $n = 2k + 1$.
   (c) it is also true for $n = 2k$.
   (d) it is also true for $n = (k + 1)^2$.
   (e) it is true for $n = 1$.

12. Evaluate

$$\sum_{k=1}^{4} k!$$

(a) 10
(b) 30
(c) 33
(d) 46
(e) 51
(f) none of the above

13. Evaluate

$$\sum_{k=1}^{10}(7k+2)$$

(a) 405
(b) 385
(c) 485
(d) 450
(e) 1000
(f) none of the above

14. The eighth term of an arithmetic sequence is 75 and the twentieth term is 39. What is the tenth term?

(a) 96
(b) 69
(c) 102
(d) 50
(e) 33
(f) none of the above

15. Find the sum of the infinite geometric series:

$$2+\frac{3}{2}+\frac{9}{8}+\frac{27}{32}+\ldots$$

(a) 2
(b) 4
(c) 6
(d) 8
(e) 10
(f) none of the above

16. The first term of a geometric sequence is 3 and the common ratio is 2. What is the 6th term?

(a) 48
(b) 192
(c) 112
(d) 96
(e) 84
(f) none of the above

17. The sequence given by

$$a_n = 2+4(n-1)$$

is:

(a) arithmetic
(b) geometric
(c) both arithmetic and geometric
(d) neither arithmetic nor geometric

18. How many different subsets are there of the set $\{a, b\}$?

(a) 1
(b) 2
(c) 3
(d) 4
(e) 5
(f) none of the above

19. Let $A = \{1, 4, 8, 10\}$, $B = \{4, 7, 9\}$, and $C = \{2, 5, 9, 10\}$. Find $B \cap (A \cup C)$.

(a) $\{4, 7, 9\}$
(b) $\{4, 7, 9, 10\}$
(c) $\{1, 2, 4, 5, 8, 9, 10\}$
(d) $\{4, 9\}$
(e) none of the above

20. Again let $A = \{1, 4, 8, 10\}$, $B = \{4, 7, 9\}$, and $C = \{2, 5, 9, 10\}$. How many elements are in the set $A \cup B \cup C$?

(a) 11
(b) 8
(c) 10
(d) 3
(e) 13
(f) none of the above

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