Math 1050 Final Exam – Fall Semester 2004 Form A

Name_____

Instructor_____

Student ID: _____ ID Verification: ____ Class Time: _____

This exam has three parts. Part I – Ten multiple choice questions
Part II – Ten open ended problems – you MUST show all your work.
Part III – Choose FIVE out of ten open eneded problems – you MUST show all your work.
This exam is closed book and closed notes.

Determine whether the relation represents a function. If it is a function, state the domain and range.

1) {(–1, 8), (1, 5), (5, –5), (7, –1)} 1) _____

A) function
domain: {–1, 1, 5, 7}
range: {8, 5, –5, –1}

B) function
domain: {8, 5, –5, –1}
range: {–1, 1, 5, 7}

C) not a function

Determine whether the sequence is geometric.

2) 4, 12, 36, 108, 324, ... 2) _____

A) geometric B) not geometric

Find an equation for the line with the given properties.

3) Perpendicular to the line $y = -3x + 3$; containing the point (–2, 3) 3) _____

A) $y = \frac{1}{3}x + \frac{11}{3}$ B) $y = 3x + \frac{11}{3}$ C) $y = -\frac{1}{3}x + \frac{11}{3}$ D) $y = -3x + \frac{11}{3}$

Express as a single logarithm.

4) $3\log_6 x + 5\log_6 (x - 6)$ 4) _____

A) $\log_6 x(x - 6)^{15}$ B) $15 \log_6 x(x - 6)$ C) $\log_6 x^3(x - 6)^5$ D) $\log_6 x(x - 6)$

Find the center (h, k) and radius r of the circle with the given equation.

5) $x^2 + y^2 + 12x - 10y = -52$ 5) _____

A) (h, k) = (–5, 6); r = 9

B) (h, k) = (5, –6); r = 3

C) (h, k) = (6, –5); r = 9

D) (h, k) = (–6, 5); r = 3

Form a polynomial f(x) with real coefficients having the given degree and zeros.

6) Degree: 3; zeros: –2 and 3 + i. 6) _____

A) $f(x) = x^3 - 8x^2 + 2x + 20$

B) $f(x) = x^3 - 4x^2 - 10x + 20$

C) $f(x) = x^3 - 4x^2 - 2x + 20$

D) $f(x) = x^3 - 6x^2 - 10x + 20$

Find the indicated term for the sequence.

7) $a_n = 2n - 2$; a_{15} 7) _____

A) 32 B) 28 C) 0 D) 30

For the function, find the average rate of change of f from 1 to x:

$\frac{f(x) - f(1)}{x - 1}, x \neq 1$

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

A) $x + 1$ B) 1 C) $\frac{x^2 - 2x - 1}{x - 1}$ D) $x - 1$

Find the domain of the composite function f ∘ g.

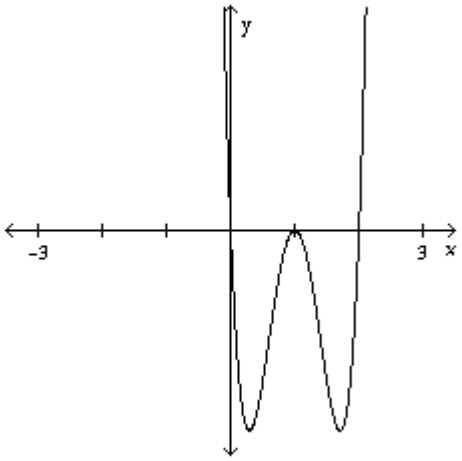
9) $f(x) = \frac{1}{x + 4}$; $g(x) = x + 7$ 9) _____

A) $\{x \mid x \neq -11\}$ B) $\{x \mid x$ is any real number$\}$

C) $\{x \mid x \neq -4\}$ D) $\{x \mid x \neq -4, x \neq -7\}$

Solve the problem.

10) Which of the following polynomial functions might have the graph shown in the illustration below? 10) _____



A) $f(x) = x(x - 2)(x - 1)^2$ B) $f(x) = x^2(x - 2)^2(x - 1)^2$

C) $f(x) = x(x - 2)^2(x - 1)$ D) $f(x) = x^2(x - 2)(x - 1)$

Part Two Questions 11–20: Short Answer
Answer all TEN questions. You must show all your work in a clear logical progression to receive full credit.

Complete the following:

11) a) Determine the domain of $\log_3(x - 24)$

b) Determine the domain of $\log_3(x)$

c) Find all the real solutions of $\log_3 x + \log_3(x - 24) = 4$

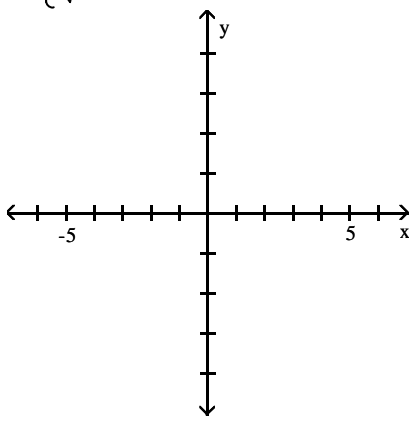
Find the real solutions of the equation.

12) $x + \sqrt{x} = 90$

Graph the function.

13)

$$f(x) = \begin{cases} -x + 2 & x < 0 \\ \sqrt{x} + 3 & x \geq 0 \end{cases}$$



Solve the system using the either inverse matrix method or Gaussian elimination.

14)

$$\begin{cases} x + 2y + 3z = 4 \\ x + y + z = 2 \\ -x + y + 2z = 9 \end{cases}$$

The inverse of $\begin{bmatrix} 1 & 2 & 3 \\ 1 & 1 & 1 \\ -1 & 1 & 2 \end{bmatrix}$ is $\begin{bmatrix} 1 & -1 & -1 \\ -3 & 5 & 2 \\ 2 & -3 & -1 \end{bmatrix}$.

Solve the problem.

15) A farmer has 1000 yards of fencing to enclose a rectangular garden. Express the area A of the rectangle as a function of the width x of the rectangle.

What is the 'real world' domain of A?

What is the vertex of A(x)?

What is the maximum area the farmer can enclose?

Find the inverse function of f. State the domain and range of f.

16) $f(x) = \frac{3x - 2}{x + 5}$

Inverse:_____

Domain of f:_____

Range of f:_____

Find the sum of the infinite geometric series.

17)

$$\sum_{k=1}^{\infty} 4\left(\frac{2}{3}\right)^{k-1}$$

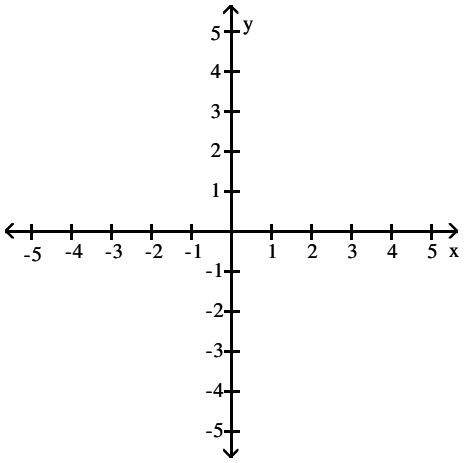
Given the ellipse find the center, foci, and vertices of the ellipse. Then Graph the ellipse.

18) $2x^2 + 3y^2 - 16x + 36y + 134 = 0$

Center: _____

Foci:_____

Vertices: _____



Complete the following steps.

19) a) Use the Factor Theorem to show $(x - 5)$ is a factor of $f(x) = x^4 - 21x^2 - 100$.

b) Use synthetic division and the Rational Roots Theorem to determine all the remaining rational zeros of f(x).

c) Factor f(x) completely over the real numbers.

Answer the following questions given the function:

20) $f(x) = \dfrac{3x - 1}{x - 1}$

a) Is the point (0,–1) on the graph?

b) If x=2, what is f(x)?

c) What is the domain of f(x)?

Part Three Questions 21–30: Self Select.
Choose FIVE out of the next TEN questions to complete. You must show all your work to get credit. CROSS OUT the problems you do not want graded.

Solve the equation.

21) $3^{6 - 3x} = \frac{1}{27}$

Solve the problem. Round your answer to three decimals.

22) How long will it take for an investment to triple in value if it earns 4.75% compounded continuously?

Determine algebraically whether the function is even, odd, or neither.

23) $f(x) = \frac{x}{x^2 - 3}$

Find the sum of the sequence.

24) $\sum_{k=1}^{5} (k - 4)$

Solve the inequality.

25) $\frac{(x - 3)^2}{x^2 - 36} > 0$

Solve the problem.

26) A local civic theater has 22 seats in the first row and 21 rows in all. Each successive row contains 3 additional seats. How many seats are in the civic theater?

Write the partial fraction decomposition of the rational expression.

27) $\dfrac{x - 3}{(x - 5)(x - 4)}$

Solve the equation.

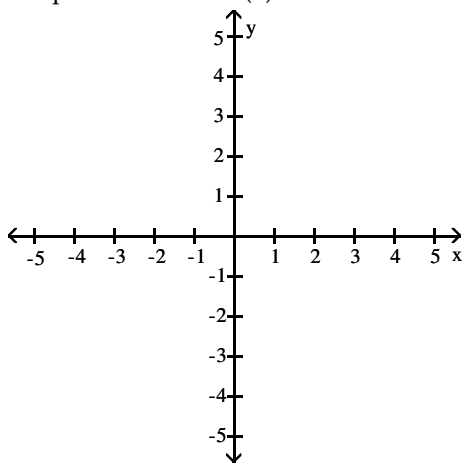
28) $3^{2x} + 3^{x} - 6 = 0$

Solve the problem.

29) A right triangle has one vertex on the graph of $y = x^2$ at (x, y), another at the origin, and the third on the (positive) y–axis at (0, y). Express the area A of the triangle as a function of x.

Use transformations to graph the function. Determine the domain, range, and vertical asymptote of the function.

30) Graph the function $f(x) = -1 + e^x$. Determine the domain, range, and horizontal asymptote.

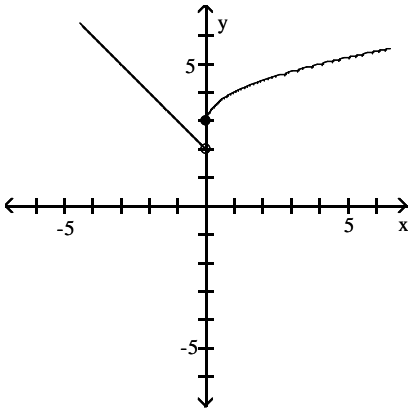


Domain: _____

Range: _____

Horizontal Asymptote: _____

1) A
2) A
3) A
4) C
5) D
6) C
7) B
8) D
9) A
10) A
11) x = 27
12) {81}
13)

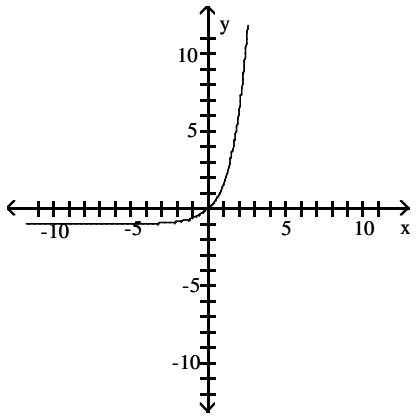


14) x = –7, y = 16, z = –7
15) $A(x) = -x^2 + 500x$; $\{x \mid 0 < x < 500\}$
16) $f^{-1}(x) = \frac{5x + 2}{3 - x}$; domain of f: $\{x \mid x \neq -5\}$; range of f: $\{y \mid y \neq 3\}$
17) 12
18) $\frac{(x - 4)^2}{3} + \frac{(y + 6)^2}{2} = 1$

center: (4, –6); foci: (5, –6), (3, –6); vertices: (5.7, –6), (2.3, –6)

19) Yes
20) function
21) 3
22) 23.129 years
23) odd
24) –5
25) $(-\infty, -6)$ or $(6, \infty)$
26) 1092 seats
27) $\frac{2}{x - 5} + \frac{-1}{x - 4}$
28) $x = \frac{\ln 2}{\ln 3}$
29) $A(x) = \frac{1}{2}x^3$

30)



domain: $(-\infty, \infty)$
range: $(-1, \infty)$
horizontal asymptote: $y = -1$