2ND Sem Rev Packet

Name: _____ Date: _____

1. Determine the order of the matrix.

$$\begin{bmatrix} -6 & 6 & 7 \\ 2 & -5 & 1 \end{bmatrix}$$

A) 2×3
B) 3×3
C) 3×1
D) 3×2
E) 2×2

2. Write the augmented matrix for the system of linear equations.

$$\begin{cases} x - 8y + 7z = -8 \\ 4y - 8z = 6 \\ x - 2z = -8 \end{cases}$$

A)
$$\left[\begin{array}{ccc|c} 1 & -8 & 7 & -8 \\ 1 & 4 & -8 & 6 \\ 1 & 1 & -2 & -8 \end{array}\right]$$

B)
$$\left[\begin{array}{ccc|c} 1 & -8 & 7 & -8 \\ 0 & 4 & -8 & 6 \\ 1 & 0 & -2 & -8 \end{array}\right]$$

C)
$$\left[\begin{array}{ccc|c} 1 & -8 & 7 & -8 \\ & 4 & -8 & 6 \\ 1 & & -2 & -8 \end{array}\right]$$

D)
$$\left[\begin{array}{ccc|c} 1 & -8 & 7 & -8 \\ 4 & -8 & 0 & 6 \\ 1 & -2 & 0 & -8 \end{array}\right]$$

E)
$$\left[\begin{array}{ccc|c} 1 & -8 & 7 & -8 \\ 0 & 4 & -8 & 6 \\ 1 & -2 & 0 & -8 \end{array}\right]$$

3. Write the system of linear equations represented by the augmented matrix. (Use variables x, y, z, and w.)

$$\left[\begin{array}{cccc|c} -1 & 0 & 0 & 6 & -7 \\ 8 & -5 & 0 & 0 & 4 \\ 0 & 3 & 3 & 8 & 9 \\ 0 & 0 & 1 & 1 & 9 \end{array}\right]$$

A)
$$\begin{cases} -x + 6y = -7 \\ 8x - 5y = 4 \\ 3x + 3y + 8z = 9 \\ x + y = 9 \end{cases}$$

B)
$$\begin{cases} -x + 6z = -7 \\ 8x - 5y = 4 \\ 3y + 3z + 8w = 9 \\ z + w = 9 \end{cases}$$

C)
$$\begin{cases} -x + 6z = -7 \\ 8x - 5z = 4 \\ 3y + 3z + 8w = 9 \\ z + w = 9 \end{cases}$$

D)
$$\begin{cases} -x + 6w = -7 \\ 8x - 5y = 4 \\ 3y + 3z + 8w = 9 \\ y + z = 9 \end{cases}$$

E)
$$\begin{cases} -x + 6w = -7 \\ 8x - 5y = 4 \\ 3y + 3z + 8w = 9 \\ z + w = 9 \end{cases}$$

4. Identify the elementary row operation being performed to obtain the new row-equivalent matrix.

Original Matrix

$$\begin{bmatrix} -2 & 7 & 1 \\ -7 & -3 & 7 \end{bmatrix}$$

New Row-Equivalent Matrix

$$\begin{bmatrix} -30 & -5 & 29 \\ -7 & -3 & 7 \end{bmatrix}$$

A) Add 4 times R_1 to R_2.
B) Add -4 times R_2 to R_1.
C) Add -4 times R_1 to R_2.
D) Add 4 times R_1 to R_1.
E) Add 4 times R_2 to R_1.

5. Perform the indicated row operations on the matrix. Show the final result.

$$\begin{bmatrix} 1 & -8 & 3 \\ -3 & 25 & -8 \\ 3 & -7 & 26 \end{bmatrix}$$

Add 3 times R_1 to R_2.
Add -3 times R_1 to R_3.

A) $\begin{bmatrix} 3 & -10 & -10 \\ -3 & 25 & -8 \\ 3 & -7 & 26 \end{bmatrix}$

B) $\begin{bmatrix} 1 & -8 & 3 \\ 0 & 1 & -5 \\ 0 & -15 & 29 \end{bmatrix}$

C) $\begin{bmatrix} 1 & -8 & 3 \\ 0 & 1 & 1 \\ 0 & 17 & 17 \end{bmatrix}$

D) $\begin{bmatrix} 1 & -8 & 3 \\ -8 & 67 & -21 \\ -8 & 13 & -75 \end{bmatrix}$

E) $\begin{bmatrix} 1 & -8 & 3 \\ 0 & 49 & -17 \\ 0 & -31 & 2 \end{bmatrix}$

6. Write the system of linear equations represented by the augmented matrix. Then use back-substitution to solve. (Use variables x, y, and z.)

$$\left[\begin{array}{ccc|c} 1 & -6 & -7 & 12 \\ 0 & 1 & 9 & -41 \\ 0 & 0 & 1 & -5 \end{array}\right]$$

A) $x = 12, y = 0, z = 0$
B) $x = 4, y = 1, z = -5$
C) $x = 1, y = -4, z = 5$
D) $x = 1, y = 4, z = -5$
E) $x = -4, y = -5, z = -1$

7. Use the matrix capabilities of a graphing utility to reduce the augmented matrix corresponding to the system of equations, and solve the system.

$$\begin{cases} x + 8y - 7z = -43 \\ -2x + 3y - 7z = -44 \\ -x - 8y + 7z = -43 \\ -6x - 4y + 4z = 42 \end{cases}$$

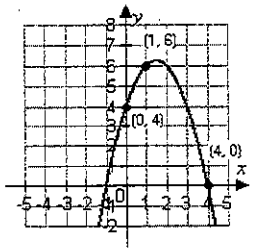
A) $x = -3, y = 2, z = 8$
B) $x = -62, y = 5, z = 3$
C) $x = -3, y = -2, z = -8$
D) $x = -3, y = 2, z = -8$
E) no solution

91. B
92. D
93. C
94. B
95. C
96. C
97. A
98. B
99. B
100. D
101. E
102. C
103. A
104. A
105. A
106. D
107. C
108. A
109. B
110. B

45. C
46. C
47. A
48. B
49. A
50. C
51. A
52. C
53. D
54. B
55. A
56. B
57. D
58. D
59. B
60. C
61. B
62. C
63. C
64. A
65. B
66. C
67. D
68. A
69. C
70. D
71. D
72. A
73. C
74. B
75. E
76. D
77. A
78. D
79. B
80. E
81. A
82. B
83. C
84. A
85. E
86. E
87. E
88. D
89. E
90. A

8. Use a system of equations to find the specified equation that passes through the points. Solve the system using matrices.

Parabola: $y = ax^2 + bx + c$



A)
$y = x^2 - 3x + 4$

B)
$y = -x^2 - 3x + 1$

C)
$y = -x^2 + 3x + 4$

D)
$y = -x^2 + 3x + 1$

E)
$y = -x^2 - 2x + 1$

9. Find x and y.

$$\begin{bmatrix} -2 & x \\ y & 6 \end{bmatrix} = \begin{bmatrix} -2 & 3 \\ 0 & 6 \end{bmatrix}$$

A) $x = -3, y = 0$
B) $x = -2, y = 6$
C) $x = 0, y = 3$
D) $x = 3, y = 0$
E) $x = 3, y = 3$

10. If possible, find $3A - 5B$.

$$A = \begin{bmatrix} 7 & -1 & -4 \\ -1 & 1 & -5 \end{bmatrix}, B = \begin{bmatrix} 3 & -9 & -4 \\ 2 & 4 & -3 \end{bmatrix}$$

A) $\begin{bmatrix} 36 & -48 & -32 \\ 7 & 23 & -30 \end{bmatrix}$

B) $\begin{bmatrix} 10 & -10 & -8 \\ 1 & 5 & -8 \end{bmatrix}$

C) $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \end{bmatrix}$

D) $\begin{bmatrix} 6 & 42 & 8 \\ -13 & -17 & 0 \end{bmatrix}$

E) not possible

11. If possible, find $A - B$.

$$A = \begin{bmatrix} -1 & -9 \\ -1 & 0 \end{bmatrix}, B = \begin{bmatrix} -5 & -1 \\ -6 & 4 \end{bmatrix}$$

A) $\begin{bmatrix} 4 & -8 \\ 5 & -4 \end{bmatrix}$

B) $\begin{bmatrix} -6 & -10 \\ -7 & 4 \end{bmatrix}$

C) $\begin{bmatrix} 4 & -9 \\ -1 & -4 \end{bmatrix}$

D) $\begin{bmatrix} -49 & 37 \\ 5 & 1 \end{bmatrix}$

E) not possible

Answer Key

1. A
2. B
3. E
4. E
5. C
6. D
7. E
8. C
9. D
10. D
11. A
12. B
13. D
14. D
15. A
16. C
17. D
18. C
19. A
20. B
21. D
22. D
23. A
24. E
25. D
26. B
27. A
28. A
29. B
30. C
31. A
32. B
33. B
34. E
35. B
36. C
37. D
38. B
39. D
40. E
41. E
42. D
43. B
44. D

108. Find the probability for the experiment of drawing two marbles (without replacement) from a bag containing three green, five yellow, and four red marbles such that both marbles are yellow.

A) $\frac{5}{33}$

B) $\frac{25}{144}$

C) $\frac{25}{132}$

D) $\frac{2}{5}$

E) $\frac{5}{7}$

109. You are given the probability that an event *will* happen. Find the probability that the event *will not* happen.

$P(E) = 0.37$

A) 0.37
B) 0.63
C) 0.315
D) 0
E) 1

110. A college sent a survey to a sample of juniors. Of the 503 students surveyed, 254 live on campus, of whom 112 have a GPA of 2.5 or greater. The other 249 juniors live off-campus, of whom 117 have a GPA of 2.5 or greater. What is the probability that a survey participant lives on campus and has a GPA of 2.5 or greater?

A) $\frac{254}{503}$

B) $\frac{112}{503}$

C) $\frac{112}{229}$

D) $\frac{56}{127}$

E) $\frac{229}{503}$

12. Evaluate the expression.

$$\begin{bmatrix} -1 & 2 \\ 3 & -4 \end{bmatrix} + \begin{bmatrix} 0 & -8 \\ -9 & -9 \end{bmatrix} + \begin{bmatrix} -8 & 3 \\ -5 & -8 \end{bmatrix}$$

A) $\begin{bmatrix} 7 & -9 \\ -1 & -5 \end{bmatrix}$

B) $\begin{bmatrix} -9 & -3 \\ -11 & -21 \end{bmatrix}$

C) $\begin{bmatrix} -1 & -6 \\ -6 & -13 \end{bmatrix}$

D) $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

E) not possible

13. If possible, find AB.

$$A = \begin{bmatrix} 3 & 1 \\ -6 & 2 \\ 5 & 0 \end{bmatrix}, B = \begin{bmatrix} 5 \\ 7 \end{bmatrix}$$

A) $\begin{bmatrix} 8 & -44 & 25 \end{bmatrix}$

B) $\begin{bmatrix} 8 \\ -44 \\ 25 \end{bmatrix}$

C) $\begin{bmatrix} 15 & 7 \\ -30 & 14 \\ 25 & 0 \end{bmatrix}$

D) $\begin{bmatrix} 22 \\ -16 \\ 25 \end{bmatrix}$

E) not possible

14. Use the matrix capabilities of a graphing utility to find AB, if possible.

$$A=\begin{bmatrix} 8 & -4 & -1 \\ 0 & 6 & 6 \\ -2 & 9 & 6 \end{bmatrix}, B=\begin{bmatrix} -8 & 2 & 6 \\ -9 & 4 & -8 \\ 9 & -1 & -7 \end{bmatrix}$$

A) $\begin{bmatrix} -64 & -8 & -6 \\ 0 & 24 & -48 \\ -18 & -9 & -42 \end{bmatrix}$

B) $\begin{bmatrix} -19 & -1 & 73 \\ -108 & 30 & -6 \\ -119 & 38 & -42 \end{bmatrix}$

C) $\begin{bmatrix} -37 & 0 & -11 \\ 1 & 18 & 26 \\ 87 & -90 & -126 \end{bmatrix}$

D) $\begin{bmatrix} -37 & 1 & 87 \\ 0 & 18 & -90 \\ -11 & 26 & -126 \end{bmatrix}$

E) not possible

15. Find A^2. (Note: $A^2 = AA$.)

$$A=\begin{bmatrix} -2 & 3 \\ -3 & 3 \end{bmatrix}$$

A) $\begin{bmatrix} -5 & 3 \\ -3 & 0 \end{bmatrix}$

B) $\begin{bmatrix} 4 & 9 \\ 9 & 9 \end{bmatrix}$

C) $\begin{bmatrix} -5 & -3 \\ 3 & 0 \end{bmatrix}$

D) $\begin{bmatrix} 4 & 3 \\ -3 & 9 \end{bmatrix}$

E) not possible

106. Find the probability for the experiment of selecting one card from a standard deck of 52 playing cards such that the card is a 10 or higher (aces are low).

A) $\frac{3}{13}$

B) $\frac{12}{13}$

C) $\frac{9}{26}$

D) $\frac{4}{13}$

E) $\frac{11}{13}$

107. Find the probability for the experiment of tossing a six-sided die twice such that the sum is 5.

A) $\frac{1}{18}$

B) $\frac{2}{9}$

C) $\frac{1}{9}$

D) $\frac{1}{36}$

E) $\frac{1}{6}$

104. Thirteen weightlifters are competing in the dead-lift competition. In how many ways can the weightlifters finish first, second, and third (no ties)?

A) 1716
B) 3
C) 2197
D) 6
E) 39

105.

Find the probability for the experiment of tossing a coin four times and getting a "tail" on the second toss. Use the sample space

$$S = \begin{matrix} HHHH & HHHT & HHTH & HTHH \\ THHH & HHTT & HTHT & THHT \\ THTH & HTTH & TTHH & TTTH \\ TTHT & THTT & HTTT & TTTT \end{matrix}$$

A) $\frac{1}{2}$

B) $\frac{7}{16}$

C) $\frac{9}{16}$

D) $\frac{1}{4}$

E) $\frac{3}{8}$

16. Given matrix $A = \begin{bmatrix} 5 & 21 \\ -10 & 7 \end{bmatrix}$. Find A^{-1} the inverse matrix.

A) $A^{-1} = \begin{bmatrix} \frac{1}{5} & \frac{1}{21} \\ \frac{1}{-10} & \frac{1}{7} \end{bmatrix}$

B) $A^{-1} = \begin{bmatrix} \frac{1}{25} & -\frac{3}{35} \\ \frac{2}{49} & \frac{1}{35} \end{bmatrix}$

C) $A^{-1} = \begin{bmatrix} \frac{1}{35} & -\frac{3}{35} \\ \frac{2}{49} & \frac{1}{49} \end{bmatrix}$

D) $A^{-1} = \begin{bmatrix} \frac{2}{35} & -\frac{1}{35} \\ \frac{1}{49} & \frac{3}{49} \end{bmatrix}$

E) $A^{-1} = \begin{bmatrix} -\frac{1}{35} & \frac{3}{35} \\ \frac{2}{49} & -\frac{1}{49} \end{bmatrix}$

17. Solve the system of linear equations

$$\begin{cases} 7x + 7y + 7z = 0 \\ 21x + 35y + 28z = 18 \\ 21x + 42y + 35z = 3 \end{cases}$$

using the inverse matrix $\frac{1}{7}\begin{bmatrix} 1 & 1 & -1 \\ -3 & 2 & -1 \\ 3 & -3 & 2 \end{bmatrix}$.

A) $\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} -\frac{15}{7} \\ \frac{33}{7} \\ -\frac{36}{7} \end{bmatrix}$

B) $\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} \frac{48}{7} \\ \frac{15}{7} \\ \frac{33}{7} \end{bmatrix}$

C) $\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} -\frac{36}{7} \\ \frac{33}{7} \\ -\frac{15}{7} \end{bmatrix}$

D) $\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} \frac{15}{7} \\ \frac{33}{7} \\ -\frac{48}{7} \end{bmatrix}$

E) $\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} -\frac{15}{7} \\ -\frac{48}{7} \\ \frac{33}{7} \end{bmatrix}$

100. How many 3-digit numbers can be formed if the leading digit cannot be zero?

A) 999

B) 9999

C) 100

D) 900

E) 899

101. A combination lock will open when the right choice of three numbers (from 1 to 30) is selected. How many different lock combinations are possible?

A) 81,000
B) 900
C) 30
D) 90
E) 27,000

102. Evaluate: ${}_8P_6$

A) 28
B) 56
C) 20,160
D) 48
E) undefined

103. Find the number of distinguishable permutations of the group of letters.

G, A, U, S, S

A) 60

B) 120

C) 30

D) 5

E) 15

97. Use the Binomial Theorem to expand and simplify the expression.

$(2x-y)^4$

A) $16x^4-32x^3y+24x^2y^2-8xy^3+y^4$

B) $16x^4-8x^3y+4x^2y^2-2xy^3+y^4$

C) $16x^4+4x^3y+6x^2y^2+4xy^3+y^4$

D) $8x^4-16x^3y+12x^2y^2-4xy^3+y^4$

E) $8x^3-12x^2y+6xy^2-y^3$

98. Find the specified nth term in the expansion of the binomial. (Write the expansion in descending powers of x.)

$(2x+5y)^{10}, n=3$

A) $15360x^7y^3$

B) $288,000x^8y^2$

C) $120x^7y^3$

D) $9,765,625y^{10}$

E) $720x^7y^3$

99. At a high school cafeteria, diners can choose one vegetable from a choice of 3 vegetables, one meat from a choice of 3 meats, one serving of bread from among 4 breads, and a dessert from among 2 desserts. How many meal configurations are possible?

A) 12
B) 72
C) 4
D) 36
E) 24

18. Use Cramer's Rule to solve the following system of linear equations:

$$\begin{cases} 4x & -8z = 2 \\ & -4y+12z = 3 \\ 8x & +20z = 0 \end{cases}$$

A) $x=\frac{1}{2}; y=-\frac{5}{4}; z=-\frac{1}{2}$

B) $x=\frac{1}{18}; y=-\frac{13}{12}; z=-\frac{1}{18}$

C) $x=\frac{5}{18}; y=-\frac{13}{12}; z=-\frac{1}{9}$

D) $x=\frac{5}{18}; y=-\frac{11}{4}; z=-\frac{1}{2}$

E) $x=-\frac{1}{2}; y=\frac{1}{2}; z=-\frac{5}{4}$

19. Find the determinant of the matrix $\begin{bmatrix} -5 & 8 \\ 0 & -1 \end{bmatrix}$.

A) 5
B) 8
C) 32
D) –40
E) –5

20. Find the minor M_{22} and its cofactor C_{22} of the matrix $\begin{bmatrix} 6 & -4 & 16 \\ 6 & 4 & -12 \\ -2 & 6 & 12 \end{bmatrix}$.

A)
$$M_{22} = \begin{vmatrix} 6 & 4 \\ -2 & 6 \end{vmatrix} = 44$$
$$C_{22} = 44$$

B)
$$M_{22} = \begin{vmatrix} 6 & 16 \\ -2 & 12 \end{vmatrix} = 104$$
$$C_{22} = 104$$

C)
$$M_{22} = \begin{vmatrix} 6 & 16 \\ 6 & -12 \end{vmatrix} = -168$$
$$C_{22} = -168$$

D)
$$M_{22} = \begin{vmatrix} 6 & 16 \\ -2 & 12 \end{vmatrix} = 104$$
$$C_{22} = -104$$

E)
$$M_{22} = \begin{vmatrix} 6 & 16 \\ 6 & -12 \end{vmatrix} = -168$$
$$C_{22} = 168$$

94. Find the sum of the infinite geometric series.
$$\sum_{n=0}^{\infty} -3\left(\frac{2}{7}\right)^n$$

A) $\frac{21}{5}$

B) $-\frac{21}{5}$

C) $-\frac{3}{5}$

D) $\frac{3}{5}$

E) undefined

95. Find P_{k+1} for the given P_k.
$$P_k = \frac{3}{k(k+1)}$$

A) $P_{k+1} = \frac{3}{k(k+1)} + 1$

B) $P_{k+1} = \frac{3}{k(k+1)} + \frac{3}{(k+1)(k+2)}$

C) $P_{k+1} = \frac{3}{(k+1)(k+2)}$

D) $P_{k+1} = \frac{3}{k(k+2)}$

E) $P_{k+1} = \frac{9}{(k+1)(k+2)}$

96. Calculate the binomial coefficient: ${}_8C_6$

A) 20,160
B) 48
C) 28
D) 1
E) 0

91. Find the indicated *n*th term of the geometric sequence.

4th term: –4, 12, –36,...

A) –13
B) 108
C) –324
D) 192
E) –768

92. Find the indicated *n*th term of the geometric sequence.

4th term: $a_2 = -\frac{4}{3}, a_7 = -\frac{4}{729}$

A) $-\frac{4}{81}$
B) $-\frac{3}{64}$
C) $-\frac{4}{243}$
D) $-\frac{4}{27}$
E) $-\frac{4}{9}$

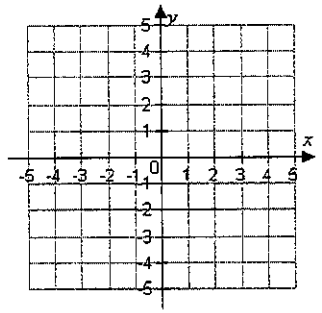
93. Use summation notation to write the sum.

$2+6+18+\ldots+4374$

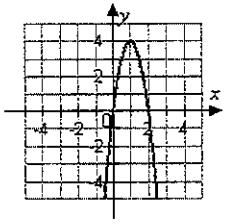
A) $\sum_{n=0}^{7} 2(3)^{n-1}$
B) $\sum_{n=1}^{6} 2(3)^{n}$
C) $\sum_{n=1}^{8} 2(3)^{n-1}$
D) $\sum_{n=1}^{6} 2(3)^{n-1}$
E) $\sum_{n=1}^{7} 2(3)^{n+1}$

21. Graph the given function.

$f(x) = \left[2(x-1)\right]^2 - 4$



A)



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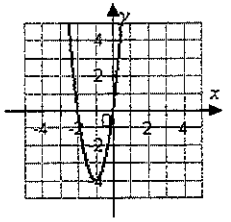

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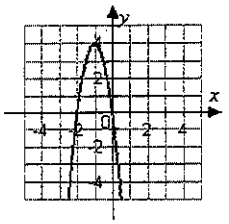

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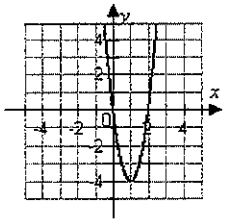
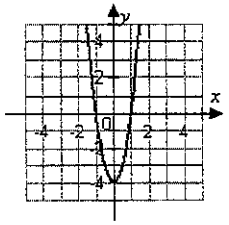


E)



22. Determine the vertex of the graph of the quadratic function $f(x)=x^2-7$.

A) $(0,7)$

B) $(-7,0)$

C) $(-7,-7)$

D) $(0,-7)$

E) $(7,0)$

87. Find a formula for a_n for the arithmetic sequence.

$a_5=26, a_{10}=66$

A) $a_n=-6+8n$

B) $a_n=14-6n$

C) $a_n=8-6n$

D) $a_n=-6(8)^n$

E) $a_n=-14+8n$

88. Find the sum of the integers from –18 to 4.

A) 10

B) 22

C) –322

D) –161

E) 20

89. Find the partial sum.

$$\sum_{n=1}^{240}(5n-1)$$

A) 144,359

B) 143,161

C) 144,840

D) 145,564

E) 144,360

90. Determine whether the sequence is geometric. If so, find the common ratio.

–3, –6, –12, –24, ...

A) 2

B) –3

C) $\frac{1}{2}$

D) –2

E) not geometric

84. Use sigma notation to write the sum.

$$\frac{1}{3\cdot 2}+\frac{1}{4\cdot 3}+\cdots+\frac{1}{8\cdot 7}$$

A) $\sum_{n=1}^{6}\frac{1}{(n+1)(n+2)}$

B) $\sum_{n=1}^{6}\frac{1}{n(n+1)}$

C) $\sum_{n=1}^{6}\frac{n}{(n+2)!}$

D) $\sum_{n=1}^{4}\frac{1}{(n+1)(n+2)}$

E) $\sum_{n=0}^{5}\frac{1}{(n+1)(n+2)}$

85. Find the sum of the infinite series.

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

A) undefined

B) $-\frac{2}{3}$

C) 2

D) $\frac{4}{5}$

E) $-\frac{2}{5}$

86. Determine whether the sequence is arithmetic. If so, find the common difference.

5, 25, 125, 625, 3125

A) 5

B) 5^n

C) $5^n - 5^{n-1}$

D) -5

E) not arithmetic

23. From the graph of the quadratic function $f(x)=(x-5)^2-3$, determine the equation of the axis of symmetry.

A) $x=5$

B) $x=-3$

C) $x=3$

D) $x=-5$

E) $x=\frac{3}{5}$

24. Determine the x-intercept(s) of the quadratic function $f(x)=x^2+2x+2$.

A) $(-7,0),(-4,0)$

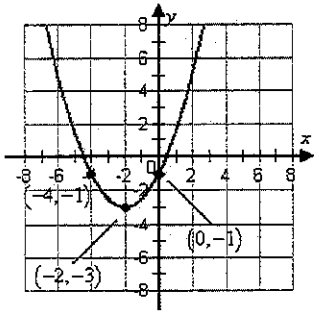
B) $(-2,0),(2,0)$

C) $(0,0),(-5,0)$

D) $(-7,0),(-5,0)$

E) no x-intercept(s)

25. Find the standard form of the quadratic function shown below:



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

B)
$f(x)=\frac{1}{4}(x-2)^2+3$

C)
$f(x)=-\frac{1}{2}(x-2)^2+3$

D)
$f(x)=\frac{1}{2}(x+2)^2-3$

E)
$f(x)=-\frac{2}{3}(x-1)^2+3$

26. Find two positive real numbers whose product is a maximum and whose sum is 136.
A) 66, 70
B) 68, 68
C) 73, 63
D) 77, 59
E) 56, 80

80. Write an expression for the apparent nth term of the sequence. (Assume that n begins with 1.)
10, 13, 16, 19, 22
A) $a_n=7n+3$
B) $a_n=(-1)^n(3n+7)$
C) $a_n=3n$
D) $a_n=3^n+7$
E) $a_n=3n+7$

81. Write the first five terms of the sequence defined recursively. Use the pattern to write the nth term of the sequence as a function of n. (Assume that n begins with 1.)
$a_1=19, a_{k+1}=a_k-4$
A) $a_n=23-4n$
B) $a_n=19-4n$
C) $a_n=27-4n$
D) $a_n=23$
E) $a_n=19(n-1)$

82. Simplify the factorial expression.
$\frac{9!}{6!}$
A) 3024
B) 504
C) $\frac{3}{2}$
D) 72
E) 5040

83. Find the sum.
$\sum_{i=1}^{4}(2i+4)$
A) 24
B) 40
C) 36
D) 12
E) 20

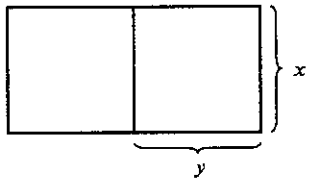
76. Use a graphing utility to approximate the solution to $\log_6 x + \log_6(2x+1) = 2$. Round to 3 decimal places.
A) 9.000
B) 8.000
C) 4.500
D) 4.000
E) no solution

77. What is the half-life of a radioactive substance if 3.9 g decays to 1.80 g in 67 hours? Round to the nearest tenth of an hour.
A) 60.1 hours
B) 45.0 hours
C) 30.0 hours
D) 15.0 hours
E) 5.4 hours

78. Write the first five terms of the sequence. (Assume that n begins with 1.)
$a_n = 2n + 7$
A) $-5, -3, -1, 1, 3$
B) $7, 9, 11, 13, 15$
C) $9, 4, 6, 8, 10$
D) $9, 11, 13, 15, 17$
E) $9, 16, 23, 30, 37$

79. Find the indicated term of the sequence.
$a_n = (-1)^n(5n-6)$
$a_{34} =$ ☐
A) -159
B) 164
C) 176
D) -24
E) 165

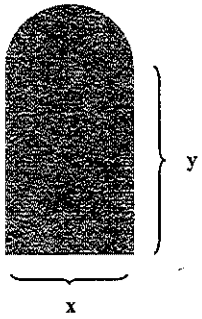
27. A farmer has 240 feet of fencing and wants to build two identical pens for his prize-winning pigs. The pens will be arranged as shown. Determine the dimensions of a pen that will maximize its area.



A) $30' \times 40'$
B) $30' \times 80'$
C) $25' \times 60'$
D) $10' \times 200'$
E) $10' \times 120'$

28. The height, $h(x)$, of a punted rugby ball is given by $h(x) = -\frac{1}{64}x^2 + \frac{19}{32}x + 3$ where x is the horizontal distance in feet from the point where the ball is punted. How far, horizontally, is the ball from the kicker when it is at its highest point?
A) 19 feet
B) 24 feet
C) 41 feet
D) 22 feet
E) 29 feet

29. A Norman window has the shape of a rectangle surmounted by a semicircle as in the figure below. If the perimeter of the window is 41 ft, express the area, A, as a function of the width, x, of the window.



A) $A(x)=\dfrac{82x-x^2}{2}$

B) $A(x)=\dfrac{164x-4x^2-\pi x^2}{8}$

C) $A(x)=\dfrac{82x+(2-\pi)x^2}{4}$

D) $A(x)=\dfrac{164x-4x^2-\pi x^2}{2}$

E) $A(x)=\dfrac{82x-2x^2-\pi x^2}{4}$

30. Describe the right-hand and the left-hand behavior of the graph of $u(x)=4x^5-10x^3-29$.

A) Because the degree is odd and the leading coefficient is positive, the graph falls to the left and falls to the right.
B) Because the degree is odd and the leading coefficient is positive, the graph rises to the left and falls to the right.
C) Because the degree is odd and the leading coefficient is positive, the graph falls to the left and rises to the right.
D) Because the degree is odd and the leading coefficient is positive, the graph rises to the left and rises to the right.
E) Because the degree is even and the leading coefficient is positive, the graph rises to the left and rises to the right.

72. Condense the expression $7(\log x-\log y)$ to the logarithm of a single term.

A) $\log\left(\dfrac{x}{y}\right)^7$

B) $\log\dfrac{7x}{7y}$

C) $\log\dfrac{x^7}{y}$

D) $\log\dfrac{x^7}{\sqrt[7]{y}}$

E) $7(\log x-\log y)$

73. Solve $\left(\dfrac{1}{5}\right)^x=125$ for x.

A) 1
B) −1
C) −3
D) −5
E) no solution

74. Solve $\ln x^2-\ln 11=0$ for x.

A) 121
B) $-\sqrt{11},\sqrt{11}$
C) e^{121}
D) $e^{11/2}$
E) no solution

75. Approximate the solution of $23e^{6x}=20$ to 3 decimal places. (You may use a graphing utility.)

A) −6.140
B) −0.078
C) −1.932
D) −0.839
E) −0.023

69. Evaluate the logarithm $\log_7 42$ using the change of base formula. Round to 3 decimal places.
A) 3.738
B) 0.521
C) 1.921
D) 7.273
E) 1.623

70. Find the exact value of $\log_5 \sqrt[3]{25}$ without using a calculator.
A) $\frac{25}{3}$
B) $\frac{3}{25}$
C) $\frac{10}{3}$
D) $\frac{2}{3}$
E) -1

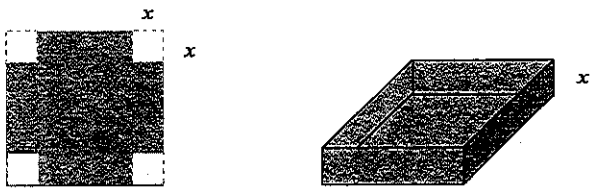
71. Expand the expression
$$\log \frac{6x^5}{y}$$
as a sum, difference, and/or constant multiple of logarithms.
A)
$5(\log 6x - \log y)$
B)
$30\log x - \log y$
C)
$5\log 6x - \log y$
D)
$\log 6 + 5\log x - \log y$
E)
$\log \frac{6x^5}{y}$

31. Describe the right-hand and the left-hand behavior of the graph of $m(x) = -8x^4 + 10x^3 + 23$.
A) Because the degree is even and the leading coefficient is negative, the graph falls to the left and falls to the right.
B) Because the degree is even and the leading coefficient is negative, the graph rises to the left and falls to the right.
C) Because the degree is even and the leading coefficient is negative, the graph falls to the left and rises to the right.
D) Because the degree is even and the leading coefficient is negative, the graph rises to the left and rises to the right.
E) Because the degree is odd and the leading coefficient is negative, the graph rises to the left and rises to the right.

32. Find all real zeros of the polynomial $f(x) = x^3 + 2x^2 - 9x - 18$ and determine the mutiplicity of each.
A) $x = 3$, multiplicity 2; $x = -2$, multiplicity 1
B) $x = 3$, multiplicity 1; $x = -3$, multiplicity 1; $x = -2$, multiplicity 1
C) $x = -2$, multiplicity 2; $x = -3$, multiplicity 1
D) $x = -3$, multiplicity 1; $x = 2$, multiplicity 1; $x = -2$, multiplicity 1
E) $x = -2$, multiplicity 3

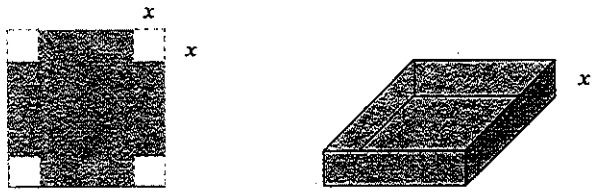
33. Using a graphing utility, graph $f(x) = x^3 - 36x$ and approximate the zeros and their multiplicity.
A) $x = 0$, multiplicity 1; $x = 6$, multiplicity 2
B) $x = 0$, multiplicity 1; $x = 6$, multiplicity 1; $x = -6$, multiplicity 1
C) $x = 0$, multiplicity 2; $x = -6$, multiplicity 1
D) $x = 0$, multiplicity 3
E) $x = 6$, multiplicity 2; $x = -6$, multiplicity 1

34. An open box is to be made from a square piece of cardboard, 32 inches on a side, by cutting equal squares with sides of length x from the corners and turning up the sides (see figure below). Determine the function, V, in terms of x, that represents the volume of the box.



A) $V(x) = -2x^3 + 32x^2$
B) $V(x) = -4x^3 + 64x^2$
C) $V(x) = 4x^3 - 64x^2 + 32x$
D) $V(x) = -4x^3 + 64x^2 - 32x$
E) $V(x) = 4x^3 - 128x^2 + 1024x$

35. An open box is to be made from a square piece of cardboard, 32 inches on a side, by cutting equal squares with sides of length x from the corners and turning up the sides (see figure below). If the volume of the box is represented by $V(x) = x(32-2x)^2$, determine the domain of $V(x)$.



A) $D = \{x \mid x > 0\}$
B) $D = \{x \mid 0 < x < 16\}$
C) $D = \{x \mid 64 < x < 128\}$
D) $D = \{x \mid 0 < x < 32\}$
E) $D = \{x \mid 16 < x < 32\}$

65. Evaluate the function $f(x) = \log_2 x$ at $x = \frac{1}{2}$ without using a calculator.

A) 0
B) -1
C) -2
D) 2
E) $\frac{1}{2}$

66. Identify the vertical asymptote of the function $f(x) = 1 + \log(x+3)$.

A) $x = 0$
B) $x = -1$
C) $x = -3$
D) $x = 3$
E) The function has no vertical asymptote.

67. Identify the x-intercept of the function $f(x) = 4\ln(x-1)$.

A) $x = 1$
B) $x = 0$
C) $x = 4$
D) $x = 2$
E) The function has no x-intercept.

68. Rewrite the logarithm $\log_3 17$ in terms of the natural logarithm.

A) $\frac{\ln 17}{\ln 3}$
B) $\frac{\ln 3}{\ln 17}$
C) $\ln 3 \ln 17$
D) $\frac{\ln 17}{\log_3 e}$
E) $\ln 17$

62. Use the One-to-One Property to solve the following equation for x.

$2^{5x} = 128$

A) $\frac{128}{5}$

B) $-\frac{64}{5}$

C) $\frac{7}{5}$

D) $\frac{5}{7}$

E) 2

63. Rewrite the logarithmic equation $\log_8 \frac{1}{64} = -2$ in exponential form.

A) $8^{64} = -2$

B) $8^{1/64} = -2$

C) $8^{-2} = \frac{1}{64}$

D) $\left(\frac{1}{64}\right)^{-2} = 8$

E) $8^{-2} = -\frac{1}{64}$

64. Rewrite the exponential equation $4^{-2} = \frac{1}{16}$ in logarithmic form.

A) $\log_4 \frac{1}{16} = -2$

B) $\log_2 16 = -2$

C) $\log_4 16 = -2$

D) $\log_{16} 4 = -2$

E) $\log_4 \frac{1}{16} = 2$

36. Use long division to divide.

$(x^4 + 3x^2 + 4) \div (x^2 - x + 3)$

A) $x^2 + x - 1$

B) $x^2 - x + 1$

C) $x^2 + x + 1 + \frac{-2x+1}{x^2 - x + 3}$

D) $x^2 - x + 1 + \frac{4x-3}{x^2 - x + 3}$

E) $x^2 + x - 1 - \frac{4}{x^2 + x - 1}$

37. Use synthetic division to divide.

$(24 + 5x^3 + 10x - 21x^2) \div (x - 3)$

A) $5x^2 - 13x + 6$

B) $5x^2 - 11x + 20$

C) $5x^2 + 10x - 12$

D) $5x^2 - 6x - 8$

E) $5x^2 - 3x - 10$

38. If $x = 3$ is a root of $x^3 + 2x^2 - 9x - 18 = 0$, use synthetic division to factor the polynomial completely and list all real solutions of the equation.

A) $(x-2)(x-3)(x+3)$; $x = 2, 3, -3$

B) $(x+2)(x-3)(x+3)$; $x = -2, 3, -3$

C) $(x+2)(x-3)^2$; $x = -2, 3$

D) $(x+2)^2(x-3)$; $x = -2, 3$

E) $(x+2)(x-2)(x+3)$; $x = -2, 2, -3$

39. Find real numbers a and b such that the equation $a + bi = 15 - 9i$ is true.

A) $a = -15, b = 9$

B) $a = 15, b = 9$

C) $a = -15, b = -9$

D) $a = 15, b = -9$

E) $a = 24, b = 6$

40. Simplify $-i-(9-4i)$ and write the answer in standard form.

A) $-9-5i$
B) $9-5i$
C) $9+3i$
D) $4i$
E) $-9+3i$

41. Simplify $(-3+i)(5-6i)$ and write the answer in standard form.

A) $13+23i$
B) $-9-33i$
C) $-27+23i$
D) $-27-21i$
E) $-9+23i$

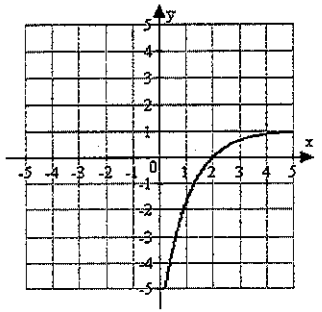
42. Write the complex conjugate of the complex number $-3-\sqrt{6}\,i$.

A) $3-\sqrt{6}\,i$
B) $-3-\sqrt{-6}\,i$
C) $3-\sqrt{-6}\,i$
D) $-3+\sqrt{6}\,i$
E) $3+\sqrt{6}\,i$

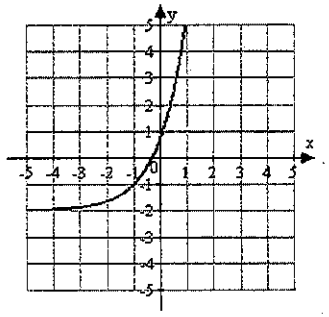
43. Simplify $\dfrac{-8-i}{6i}$ and write the answer in standard form.

A) $\dfrac{1}{6}+\dfrac{4i}{3}$
B) $-\dfrac{1}{6}+\dfrac{4i}{3}$
C) $-\dfrac{1}{6}-\dfrac{4i}{3}$
D) $-\dfrac{4}{3}-\dfrac{i}{6}$
E) $\dfrac{4}{3}-\dfrac{i}{6}$

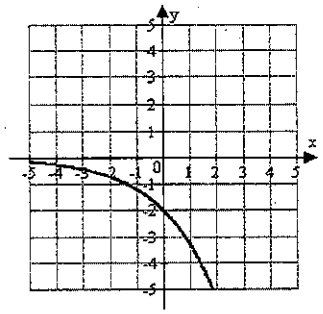
C)



D)

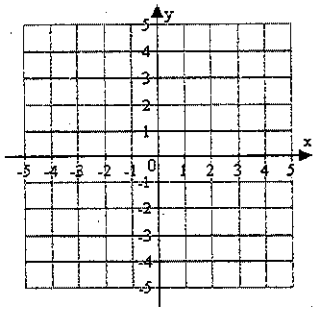


E)

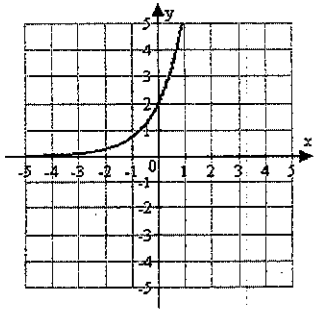


61. Sketch the graph of the function

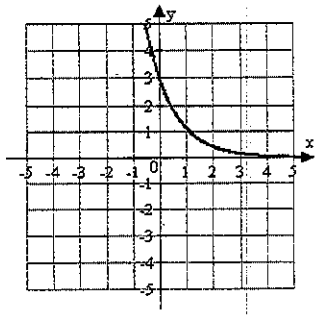
$f(x) = 3e^{-x}$.



A)



B)



44. Find all zeros of the function $f(x) = (x-2)(x+3i)(x-3i)$.

A) $x = -2, -3i, 3i$
B) $x = 2, 3i$
C) $x = 2, -3, 3$
D) $x = 2, -3i, 3i$
E) $x = 2$

45. Use the *zero* or *root* feature of a graphing utility to approximate the zeros of the function $f(x) = x^6 - 4x^4 + x^2 + 6$ accurate to the nearest thousandth.

A) ± 1, 1.732, 1.414
B) $\pm i$, -1.732, -1.414
C) $\pm i$, ± 1.732, ± 1.414
D) 1.732, 1.414
E) ± 1, -1.732, 1.414

46. Use Descartes' Rule of Signs to determine the possible number of positive and negative zeros of $f(x) = 6x^3 + 6x^2 + 4x + 1$.

A) 3 positive reals or 1 positive real; 3 negative reals or 1 negative real
B) 3 positive reals or 1 positive real; no negative reals
C) 0 positive real; 3 negative reals or 1 negative real
D) 1 positive real; 3 negative reals or 1 negative real
E) no positive reals; no negative reals

47. Find all the real zeros of $f(x) = 9x^3 + 24x^2 + 13x + 2$.

A) $x = -\frac{1}{3}, -2$
B) $x = -\frac{3}{2}, \frac{1}{2}$
C) $x = -\frac{1}{2}, 3$
D) $x = -\frac{1}{3}, \frac{1}{2}$
E) $x = -\frac{1}{3}, 2$

48. Consider the function $f(x)=\frac{2}{(x+9)^2}$. Find the function's domain and identify any horizontal and vertical asymptotes.

A) **domain:** all real numbers x except for $x=9$; **vertical asymptote:** $x=9$; **horizontal asymptote:** $y=0$

B) **domain:** all real numbers x except for $x=-9$; **vertical asymptote:** $x=-9$; **horizontal asymptote:** $y=0$

C) **domain:** all real numbers x except for $x=-9$; **vertical asymptote:** $x=-9$; **horizontal asymptote:** $y=\frac{2}{9}$

D) **domain:** all real numbers x except for $x=-9$; **vertical asymptote:** $x=9$; **horizontal asymptote:** $y=0$

E) **domain:** all real numbers x except for $x=-9$; **vertical asymptote:** $x=9$; **horizontal asymptote:** $y=\frac{2}{9}$

49. Consider the function $f(x)=\frac{9-2x}{4+3x}$. Find the function's domain and identify any horizontal and vertical asymptotes.

A) **domain:** all real numbers x except for $x=-\frac{4}{3}$; **vertical asymptote:** $x=-\frac{4}{3}$; **horizontal asymptote:** $y=-\frac{2}{3}$

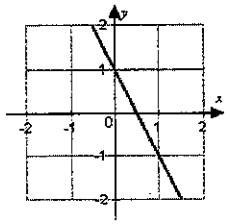
B) **domain:** all real numbers x except for $x=\frac{4}{3}$; **vertical asymptote:** $x=-\frac{4}{3}$; **horizontal asymptote:** $y=-\frac{2}{3}$

C) **domain:** all real numbers x except for $x=-\frac{4}{3}$; **vertical asymptote:** $x=\frac{4}{3}$; **horizontal asymptote:** $y=-\frac{2}{3}$

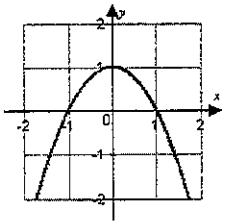
D) **domain:** all real numbers x except for $x=-\frac{4}{3}$; **vertical asymptote:** $x=-\frac{4}{3}$; **horizontal asymptote:** $y=\frac{2}{3}$

E) **domain:** all real numbers x except for $x=\frac{4}{3}$; **vertical asymptote:** $x=\frac{4}{3}$; **horizontal asymptote:** $y=-\frac{2}{3}$

D)



E)



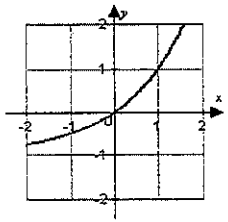
60. Identify the operation that will transform the graph of $f(x)=3^x$ into the graph of $g(x)=3^{x+3}$.

A) $g(x)$ is obtained by shifting $f(x)$ 3 units upward (positive).
B) $g(x)$ is obtained by shifting $f(x)$ 3 units downward (negative).
C) $g(x)$ is obtained by shifting $f(x)$ 3 units to the left (negative).
D) $g(x)$ is obtained by shifting $f(x)$ 3 units to the right (positive).
E) $g(x)$ cannot be obtained by any of these tranforms.

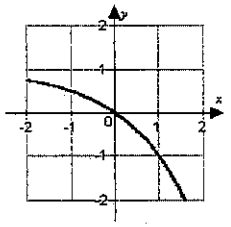
59. Identify the graph of the function.

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

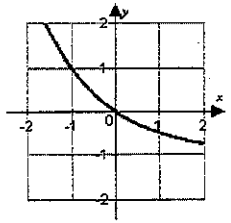
A)



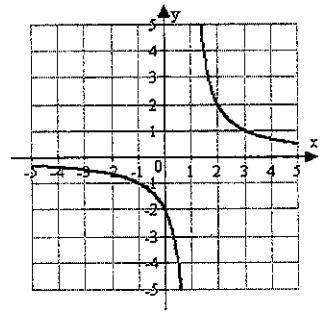
B)



C)



50. Identify the function whose graph is provided.



A) $f(x) = \dfrac{2x}{x-1}$

B) $f(x) = \dfrac{2}{x+3}$

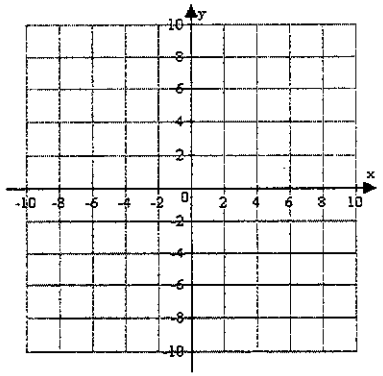
C) $f(x) = \dfrac{2}{x-1}$

D) $f(x) = \dfrac{2x}{x+3}$

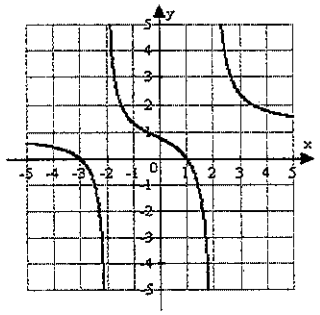
E) $f(x) = \dfrac{2x^2}{x^2-1}$

51. For the function given below, determine the domain, the x-intercepts, and any vertical and horizontal asymptotes. Use all of this information plus any additional solution points as needed to sketch the graph of the function.

$$f(x)=\frac{x^2+2x-3}{x^2-4}$$



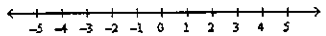
A)



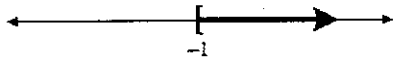
58. Evaluate the function $f(x)=1.1^x$ at $x = 1.8$. Round to 3 decimal places.

A) 1.909
B) 1.980
C) 3.802
D) 1.187
E) 1.210

56. Graph the solution of $x^2 - 6x - 7 \geq 0$ on a number line.

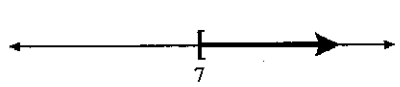


A)



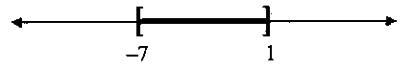
B)

C)



D)

E)



57. Solve: $\frac{5x-5}{x-5} \geq 2$

A) $\left(-\infty, -\frac{5}{3}\right]$

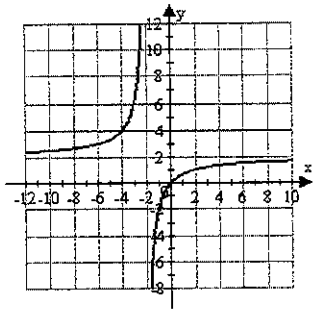
B) $[5, \infty)$

C) $\left(-\infty, -\frac{5}{3}\right) \cup \left(-\frac{5}{3}, \infty\right)$

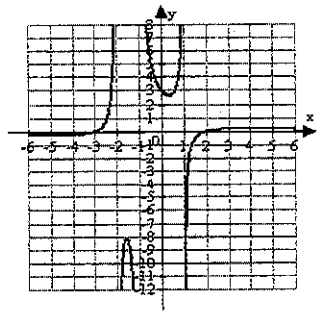
D) $\left(-\infty, -\frac{5}{3}\right] \cup (5, \infty)$

E) $\left[-\frac{10}{3}, 5\right) \cup (5, \infty)$

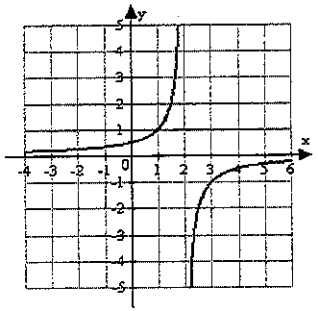
B)



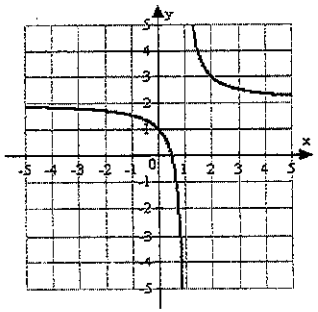
C)



D)



E)



54. Find all x-intercepts for the function $y=\dfrac{3x+5}{5x+8}$.

A) $x=\dfrac{5}{3}$

B) $x=-\dfrac{5}{3}$

C) $x=-\dfrac{8}{5}$

D) $x=\dfrac{8}{5}$

E) There are no x-intercepts.

55. Which of the following is not a solution to the inequality $x^2-25\le 0$?

A) $x=-6$

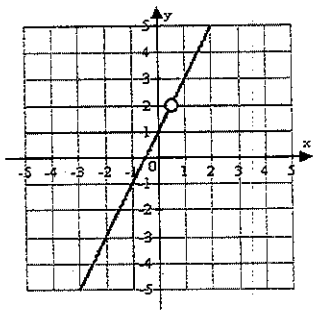
B) $x=-5$

C) $x=\dfrac{5}{2}$

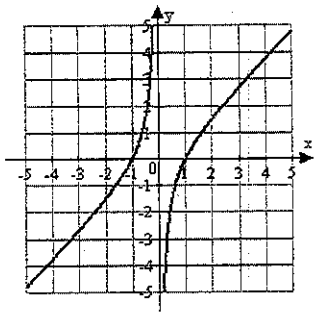
D) $x=-2$

E) $x=0$

D)



E)



52. Simplify $f(x)=\dfrac{-7x+6}{7x^2-6x}$, and find any vertical asymptotes.

A) $f(x)=\dfrac{1}{x}$, $x\neq -\dfrac{6}{7}$; **vertical asymptote:** $x=0$

B) $f(x)=\dfrac{1}{7x-6}$, $x\neq 0$; **vertical asymptote:** $x=\dfrac{6}{7}$

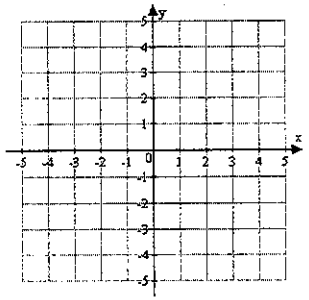
C) $f(x)=-\dfrac{1}{x}$, $x\neq \dfrac{6}{7}$; **vertical asymptote:** $x=0$

D) $f(x)$ cannot be simplified; **vertical asymptotes:** none

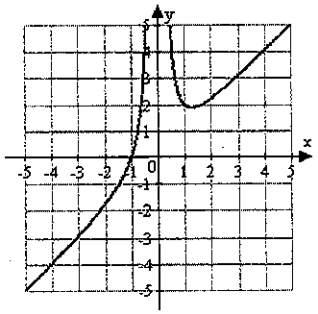
E) $f(x)$ cannot be simplified; **vertical asymptotes:** $x=0$ and $x=\dfrac{6}{7}$

53. For the function given below, determine the domain, all x-intercepts, and find any vertical and slant asymptotes. Use all of this information plus any additional solution points as needed to sketch the graph of the function on the axes provided.

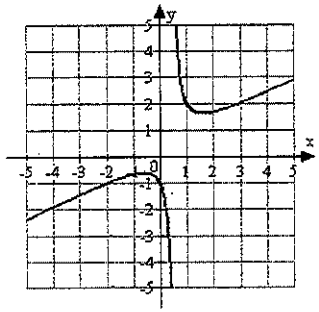
$$f(x)=\frac{4x^2-1}{2x-1}$$



A)



B)



C)