Midterm Exam will cover problems #1-39.
Final Exam will cover problems #1-90.

Add or subtract as indicated and write the result in standard form.
1) \((-3 + 6i) + (-7 - 3i) + (4 - 6i)\)

Find the product and write the result in standard form.
2) \((5 + 4i)(8 - 7i)\)
3) \((3 + 5i)^2\)

Divide and express the result in standard form.
4) \(\frac{7 + 6i}{4 - 2i}\)

Perform the indicated operations and write the result in standard form.
5) \(5\sqrt{-36} + 2\sqrt{-81}\)
6) \(-\frac{35 + \sqrt{-98}}{7}\)

Use the graph of the function \(f\), plotted with a solid line, to sketch the graph of the given function \(g\).
8) \(g(x) = -f(x) - 2\)
9) \(g(x) = f(x - 2)\)
10) \(g(x) = f(x - 1) - 2\)
Find the domain of the function.
11) \( g(x) = \frac{x}{x^2 - 64} \)

12) \( f(x) = \sqrt{18 - x} \)

Given functions \( f \) and \( g \), perform the indicated operations.
13) Given \( f(x) = 3x + 1 \) and \( g(x) = 5x - 9 \), find: \( f + g \), \( f - g \), and \( fg \).

For the given functions \( f \) and \( g \), find the indicated composition.
14) \( f(x) = 6x + 10 \), \( g(x) = 5x - 1 \)
\( (f \circ g)(x) \)

15) \( f(x) = 4x^2 + 5x + 4 \), \( g(x) = 5x - 7 \)
\( (g \circ f)(x) \)

Find the domain of the composite function \( f \circ g \).
16) \( f(x) = \frac{4}{x + 8} \), \( g(x) = x + 2 \)

Determine which two functions are inverses of each other.
17) \( f(x) = \frac{x + 7}{2} \), \( g(x) = 2x + 7 \), \( h(x) = \frac{x - 7}{2} \)

Find the inverse of the one-to-one function.
18) \( f(x) = \sqrt{x - 5} \)

Use the graph of \( f \) to draw the graph of its inverse function.
19)

Identify the vertex of the parabola.
20) \( f(x) = (x + 6)^2 - 2 \)

Find the coordinates of the vertex for the parabola defined by the given quadratic function.
21) \( f(x) = -x^2 - 2x + 6 \)

Determine the axis of symmetry of the parabola.
22) \( f(x) = (x + 4)^2 + 5 \)

Determine the range of the quadratic function.
23) \( f(x) = 6 - (x + 4)^2 \)

Find the \( x \)-intercepts and the \( y \)-intercept for the graph of the quadratic function.
24) \( f(x) = (x + 9)^2 - 14 \)

Graph the given quadratic function.
25) \( f(x) = -4(x - 5)^2 + 5 \)

Solve the problem.
26) An arrow is shot upward into the air at a speed of 64 feet per second from a platform that is 31 feet high. The height of the arrow is given by the function \( h(t) = -16t^2 + 64t + 31 \), where \( t \) is the time in seconds. After how many seconds does the arrow reach its maximum height? Determine the maximum height of the arrow.

Use the Leading Coefficient Test to determine the end behavior of the polynomial function.
27) \( f(x) = -3x^4 - 3x^3 - 3x^2 + 2x + 3 \)

28) \( f(x) = x^3 - 2x^2 + 2x + 3 \)

Find the zeros for the polynomial function and give the multiplicity for each zero. State whether the graph crosses the \( x \)-axis or touches the \( x \)-axis and turns around, at each zero.
29) \( f(x) = 5(x + 7)(x - 6)^2 \)
Sketch the graph of the polynomial function.

30) \( f(x) = x^4 - 4x^2 \)

Determine the graph of the polynomial function.

31) A function of odd degree that has a negative leading coefficient and three distinct real roots.

A) 

B) 

C) 

Divide using long division.

32) \((-2x^5 - x^3 + 4x^2 + 114x - 28) \div (x^2 - 7)\)

Divide using synthetic division.

33) \(\frac{x^5 + x^3 + 2}{x + 3}\)

Use synthetic division and the Remainder Theorem to find the indicated function value.

34) \( f(x) = x^5 + 6x^4 - 2x^3 + 6; f(2) \)

Use the graph to determine a solution of the equation. Use synthetic division to verify that this number is a solution of the equation. Then solve the polynomial equation.

35) \( x^3 + 6x^2 + 11x + 6 = 0 \)

Use the Rational Zero Theorem to list all possible rational zeros for the given function.

36) \( f(x) = -2x^3 + 3x^2 - 2x + 8 \)
Find a rational zero of the polynomial function and use it to find all the zeros of the function.

37) \( f(x) = x^3 + 6x^2 + 7x - 2 \)

38) \( f(x) = x^3 + 6x^2 + 21x + 26 \)

Find an \( n \)th degree polynomial function with real coefficients satisfying the given conditions.

39) \( n = 4; 2i, 3, \) and \(-3\) are zeros; leading coefficient is 1

*** Stop Here for the Midterm ***

Find the domain of the rational function.

40) \( g(x) = \frac{x + 5}{x^2 + 49x} \)

Find the vertical asymptotes, if any, of the graph of the rational function.

41) \( f(x) = \frac{x - 9}{x^2 - 13x + 40} \)

Find the horizontal asymptote, if any, of the graph of the rational function.

42) \( f(x) = \frac{5x}{5x + 7} \)

Find the slant asymptote, if any, of the graph of the rational function.

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

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

Graph the rational function.

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

Determine the graph of the function.

46) A rational function has a denominator of \( x^2 + x - 20 \). The numerator is first degree monomial with a positive leading coefficient.

A)  

B)  

C)  

D)
Solve the polynomial inequality and graph the solution set on a number line. Express the solution set in interval notation.

47) \((x + 1)(x - 4) \leq 0\)

48) \(x^2 + 7x + 10 > 0\)

Solve the rational inequality and graph the solution set on a real number line. Express the solution set in interval notation.

49) \(\frac{x - 6}{x + 5} > 0\)

50) \(\frac{3}{x - 5} < 1\)

51) \(\frac{x}{x + 3} \geq 2\)

Graph the functions by making a table of coordinates.

52) \(f(x) = 3^x\)

53) \(f(x) = 3^{-x}\)

Use the compound interest formulas \(A = P \left(1 + \frac{r}{n}\right)^{nt}\) and \(A = Pe^{rt}\) to solve.

54) Find the accumulated value of an investment of $8000 at 9% compounded continuously for 4 years.

55) Find the accumulated value of an investment of $5000 at 5% compounded monthly for 8 years.

Write the equation in its equivalent exponential form.

56) \(\log_5 x = 3\)

Write the equation in its equivalent logarithmic form.

57) \(3\sqrt[3]{64} = 4\)

Evaluate the expression without using a calculator.

58) \(\log_5 \frac{1}{125}\)

Graph the function.

59) Use the graph of \(f(x) = \log x\) to obtain the graph of \(g(x) = \log x - 2\).

Use properties of logarithms to condense the logarithmic expression.

60) \(5 \log_b t - \log_b s + 3 \log_b z\)

Use common logarithms or natural logarithms and a calculator to evaluate to four decimal places.

61) \(\log_2 361\)

Graph the logarithmic function. Find the domain.

62) \(f(x) = \log_3 (x + 2)\)

Solve the equation by expressing each side as a power of the same base and then equating exponents.

63) \(64^x = 16\)

Solve the exponential equation. Express the solution set in terms of natural logarithms.

64) \(e^{4x} = 7\)

65) \(e^{x + 7} = 5\)

66) \(2^{x + 7} = 3\)

Solve the logarithmic equation. Be sure to reject any value that is not in the domain of the original logarithmic expressions. Give the exact answer.

67) \(\log_2 (x + 4) = 3\)

68) \(\log_3 (x + 2) = -1\)

69) \(\log_3 (x + 2) - \log_3 x = 2\)

70) \(\ln x + \ln (x + 4) = \ln 72\)
Solve the system by the method of your choice.

71) \( y = 27 - 6x \)
\( 6x + y = 45 \)

72) \( 4x + y = 16 \)
\( 16x + 4y = 64 \)

73) \( x + 5y = 17 \)
\( 5x + 4y = 22 \)

Solve the problem.

74) A vendor sells hot dogs and bags of potato chips. A customer buys 2 hot dogs and 5 bags of potato chips for $6.25. Another customer buys 4 hot dogs and 2 bags of potato chips for $6.50. Find the cost of each item.

Solve the system of equations.

75) \( x + y + z = 5 \)
\( x - y + 3z = 19 \)
\( 2x + y + z = 7 \)

Solve the nonlinear system by the substitution method.

76) \( x + y = 27 \)
\( y = x^2 - 14x + 49 \)

Graph the solution set of the system of inequalities.

77) \( 3x - y \leq -3 \)
\( x + 2y \geq 6 \)

Graph the solution set for the following system of inequalities.

78) \( 2x + 3y \leq 6 \)
\( x - y \leq 3 \)
\( y \leq 2 \)

Find the maximum or minimum value of the given objective function of a linear programming problem. The figure illustrates the graph of the feasible points.

79) Objective Function: \( z = 6x + 8y \)
Find maximum and minimum.

Solve the problem.

80) Mrs. White wants to crochet hats and afghans for a church fundraising bazaar. She needs 6 hours to make a hat and 4 hours to make an afghan, and she has no more than 56 hours available. She has material for no more than 12 items, and she wants to make at least two afghans. Let \( x \) = the number of hats she makes and \( y \) = the number of afghans she makes. Write a system of inequalities that describes these constraints.

Give the order of the matrix, and identify the given element of the matrix.

81) \( A = \begin{bmatrix} 5 & -7 & 0 & 6 \\ 11 & -5 & 10 & -3 \end{bmatrix} \); \( a_{12} \)

Solve the matrix equation for \( X \).

82) Let \( A = \begin{bmatrix} 2 & -2 \\ -8 & 0 \\ 7 & -5 \end{bmatrix} \) and \( B = \begin{bmatrix} 7 & 0 \\ 0 & -7 \\ 2 & -5 \end{bmatrix} \);
\( 4X + A = B \)
Find the product AB, if possible. If \( AB = (ab)_{ij} \), then identify the entry \((ab)_{23}\).

83) \( A = \begin{bmatrix} 3 & 0 \\ -2 & 1 \\ 0 & 5 \end{bmatrix} \) and \( B = \begin{bmatrix} 1 & 3 & -2 \\ 4 & 0 & 5 \end{bmatrix} \)

Find the product AB, if possible. If \( AB = (ab)_{ij} \), then identify the entry \((ab)_{32}\).

84) \( A = \begin{bmatrix} 9 & -2 & 9 \\ 7 & 2 & 3 \\ -4 & 1 & -4 \end{bmatrix} \) and \( B = \begin{bmatrix} 2 & -4 & 8 \\ 1 & 3 & 3 \\ 8 & 2 & 3 \end{bmatrix} \)

Find the product \( AB \) using row by column multiplication.

85) \( A = \begin{bmatrix} -1 & 3 \\ 2 & 3 \end{bmatrix} \) and \( B = \begin{bmatrix} -2a & 3b \\ -a & -2b \end{bmatrix} \)

Evaluate the determinant.

86) \( \begin{vmatrix} -4 & -6 \\ -2 & 8 \end{vmatrix} \)

87) \( \begin{vmatrix} 1 & 1 \\ 12 & 9 \end{vmatrix} \)

\( \begin{vmatrix} 9 & 11 \\ 4 & 2 \end{vmatrix} \)

Solve for "x" using the definition of determinants.

88) \( \begin{vmatrix} x & -5 \\ 2 & -7 \end{vmatrix} = 38 \)

89) \( \begin{vmatrix} -9 & x \\ 3 & 3 \end{vmatrix} = -24 \)

Evaluate the determinant using a graphing calculator.

90) \( \begin{vmatrix} 2 & 3 & -3 \\ 2 & 0 & -2 \\ 4 & 0 & -3 \end{vmatrix} \)