A. Completely factor each expression below and write your answers in simplest form. There are no 
prime expressions; that is, each expression will factor somehow if done properly.

1. \(x^2 - 12x + 11\)
2. \(x^2 - 11x - 60\)
3. \(6x^2 + 45x + 21\)
4. \(9x^2 + 13x - 10\)
5. \(5x^5 + 20x^3 - 7x^2 - 28\)
6. \(x^2 - 64\)
7. \(2x^9 - 32x^7\)
8. \(x^8 - 1\)
9. \(x^4 + 4x^2 - 5\)
10. \(x^2 + 30x + 225\)

B. Simplify each expression completely. Write your answers in simplest form.

11. \(\left(\frac{2x^5}{3}\right)^3\)
12. \(\frac{3^{-2}}{x^{-10}}\)
13. \(\frac{5x}{x+3} + \frac{15}{x+3}\)
14. \(\sqrt{72}\)
15. \(\frac{x^2-x-6}{5} \cdot \frac{10x-20}{x} \div \frac{x^2-4}{2x}\)
16. \(\sqrt{100} - \sqrt{144}\)
17. \(\sqrt{20x^{11}}\)
18. \[
\frac{36x^3y^5z^7}{20x^7y^5z^3}
\]
19. \[(11x^{-9}y^8)(7x^{-6}y^2)\]
20. \[(10x + 1)(3x - 5)\]

C. Determine all solutions to each equation below. Be sure to completely reduce your final answers.

21. \[\sqrt{x + 5} = 9\]
22. \[43 + \sqrt{9 - 2x} = 27\]
23. \[x^2 + 9 = 0\]
24. \[x^3 - 3x^2 = -2x\]
25. \[5x^3 + 15x^2 - 20x - 60 = 0\]
26. \[2x^2 - 4x + 1 = 0\]
27. \[x^2 = 5x + 10\]
28. \[-3x - 14 = -2(-5x - 7)\]
29. \[x^2 = 32x - 31\]
30. \[\frac{5}{11}(x + 4)^2 = \frac{11}{20}\]
31. \[x^6 - 7x^3 - 8 = 0\]
32. \[3(x + 2)^2 + 13 = -14\]
33. \[\frac{6}{x+7} = \frac{x}{x+2}\]
34. \[\frac{4x}{x+5} + \frac{1}{x-2} = \frac{2x+3}{x^2+3x-10}\]

D. Completely simplify each expression below. Be sure to completely reduce your final answers.

35. \[(5 - 6i) + (43 + 11i)\]
36. \[(3 + 7i) - (4 - 4i)\]
37. \[(6 + i)(4 - 9i)\]
38. \((-1 - 5i)(-2 - 3i)\)
39. \(\frac{5-2i}{1+7i}\)

E. Determine the slope of each line described below.

40. The line with equation \(y = \frac{3}{5}x - 10\)
41. The line passing through the points (2, 11) and (2, -4)
42. The line perpendicular to \(y = -\frac{4}{9}x + 6\)
43. The line parallel to \(y = -\frac{1}{2}x + 1\) passing through the point (3, 4)
44. The line passing through the points (-2, -5) and (4, -9)

F. Complete each exercise below.

45. Rewrite the following linear equation in slope-intercept form: \(7x - 2y = 26\)
46. Rewrite the following linear equation in slope-intercept form: \(y - \frac{3}{4} = -\frac{5}{8}(x - \frac{18}{5})\)
47. Write the equation of the line with a slope of \(\frac{2}{3}\) and y-intercept of 6 in slope-intercept form.
48. Write the equation of the line parallel to \(y = -\frac{7}{2}x + 11\) passing through the point (0, -9) in slope-intercept form.
49. Write the equation of the line passing through (4, 1) and (-4, -2) in slope-intercept form.
50. Determine the distance between the points (5, 1) and (-3, -3).
51. Determine the midpoint of (2, 5) and (9, 3).
52. Determine the center of the circle described by the equation \((x + 2)^2 + (y + 11)^2 = 40\).
53. Determine the vertex of the parabola described by the equation \(f(x) = 3(x + 2)^2 - 1\).
54. Determine the minimum value of the parabola described by the equation \(y = 6x^2 - 30x - 5\).
G. Use your graphing calculator to complete each exercise below. Round answers to 2 decimal places.

55. Use the following function to complete each exercise below:
   \[ f(x) = -\frac{1}{2}x^2 + x + 4 \]
   a. Determine all zeros of the function.
   b. Determine any relative minima of the function.
   c. Determine the interval(s) on which the function is increasing.
   d. Determine the value of \( f(10) \).

56. Use the following function to complete each exercise below:
   \[ f(x) = -x^3 - 4x^2 + 3x + 9 \]
   a. Determine any relative maxima of the function.
   b. Determine any relative minima of the function.
   c. Determine the interval(s) on which the function is increasing.
   d. Determine the value of \( f(10) \).

57. Use the following function to complete each exercise below:
   \[ f(x) = 0.15x^4 - x^3 - 0.2x^2 + 3x + 4 \]
   a. Determine any relative maxima of the function.
   b. Determine any relative minima of the function.
   c. Determine the absolute maximum of the function.
   d. Determine the absolute minimum of the function.
   e. Determine the interval(s) on which the function is increasing.
   f. Determine the interval(s) on which the function is decreasing.
   g. Determine all \( x \)-intercepts of the function.
   h. Determine all \( y \)-intercepts of the function.
   i. Determine the value of \( f(10) \).

H. Complete each exercise below.

58. Determine all \( x \)- and \( y \)-intercepts of the following function:
   \[ f(x) = \frac{2x^2 + x - 6}{x + 1} \]

59. Determine the equation of the oblique asymptote(s) of the following function:
   \[ f(x) = \frac{4x^3 - 8x^2 - x + 2}{2x^2 + 3x + 1} \]
Use the given coordinate axes to graph the given function by hand. Identify all items listed below in the spaces provided or state they do not exist as appropriate. (Hint: factor first.)

\[ f(x) = \frac{x^3 + 5x^2 - 4x - 20}{x^2 + 2x - 15} \]

- \( x \)-intercept(s):
- \( y \)-intercept(s):
- Hole(s):
- Vertical asymptote(s):
- Horizontal asymptote(s):
- Oblique asymptote(s):
I. Complete each word problem below. You must write an appropriate equation for each exercise using the techniques discussed in class.

61. A video game system was on sale for 35% off. If this discount saved a buyer $60, what was the original price of the video game system?

62. Two planes leave Chicago O'Hare International Airport at 11:27 a.m. One is flying due east toward New York City, and the other is flying due west toward Los Angeles. If the plane flying the New York route is flying at 650 miles per hour, and the plane flying the Los Angeles route is flying at 530 miles per hour, at what time (to the nearest minute) will they be exactly 2000 miles apart?

63. Four times the middle of three consecutive odd integers is fourteen more than the sum of the other two. Determine the values of the three numbers.

64. In triangle ABC, angle B is five times the measure of angle A, and angle C is four less than twice the measure of angle A. Determine the measure of each angle.

65. Ignoring the units (i.e., feet, meters, square centimeters, etc.), a rectangle has an area equal to three times the square of its width. Determine the dimensions (length and width) of the rectangle if its perimeter is 16.

66. A mechanic wants to fence in a part of his parking lot to be set aside for long-term repair jobs. He can afford to buy a total of 120 feet of fencing. What is the maximum area he can fence off if he uses the building as one side of the fenced in area, and what are the dimensions (length and width) that give him that area?

67. A mechanic wants to fence in a part of his parking lot to be set aside for long-term repair jobs. He can afford to buy a total of 120 feet of fencing. What is the maximum area he can fence off if he must put fencing on all four sides of the fenced in area, and what are the dimensions (length and width) that give him that area?

68. A man and a woman start walking from the same point at the same time. The man walks 400 feet due west while the woman walks due south. If they are exactly 850 feet apart, how far has the woman walked?

69. A ferry travels at a speed of 25 knots in still water. If the ferry travels 42 miles upstream, immediately turns around, and then returns 42 miles downstream in a total of 4 hours, what is the speed of the current? (Hint: write an equation for time rather than distance.)

70. The product of two consecutive positive integers is 132. Find the integers.
\[ a^2 + b^2 = c^2 \]

\[ d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} \]

\[ M = \left( \frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right) \]

\[ (x - h)^2 + (y - k)^2 = r^2 \]

\[ m = \frac{y_2 - y_1}{x_2 - x_1} \]

\[ y = mx + b \]

\[ y - y_1 = m(x - x_1) \]

\[ Ax + By = C \]

\[ d = rt \]

\[ I = Prt \]

\[ x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \]

\[ y = a(x - h)^2 + k \]

\[ \left( -\frac{b}{2a}, f\left( -\frac{b}{2a} \right) \right) \]