Intermediate Algebra

Write your name only on this question sheet. Show all work and all answers on separate pages. Use only one side of your paper and leave enough room between problems for comments and grading. Indicate your answers clearly. (Each problem worth 5 points)

Polynomial Function Question.

1. You throw a ball off the top of a 90-foot tall building with an initial velocity of 15 ft/sec. It misses the top on the way down and falls to the ground. The ball’s height above the ground can be modeled by the polynomial function: 
   \[ h(t) = -16t^2 + 15t + 90 \], where \( h(t) \) = height in feet, \( t \) = time in seconds.
   a. Find and interpret \( h(2) \).
   b. Find how long it takes for the ball to fall back to the height of the top of the building.

Multiply out the given polynomials.

2. \((3x - 2)(x^2 - 5x + 2)\)
3. \((4x + 1)^2\)
4. \((2x - 3y)(2x + 3y)\)
5. \((x + y - 2)(x + y + 2)\)

Factor Completely.

6. \(3x^2y - 15xy^3 + 3xy\)
7. \(3x^2 - 21x + 36\)
8. \(25x^2 + 20x + 4\)
9. \(x^3 + 64\)

Solve the following Polynomial Equations.

10. \(x^2 - 7x + 10 = 0\)
11. \(x^3 - 2x^2 = x - 2\)

Rational Function Question.

12. As part of an experiment in memory, students in a psychology class are asked to memorize 40 Russian words. After studying the words for one day, students are tested each day thereafter to see how many words they remember. The class average is then found. The function \( f(x) = \frac{5x + 30}{x} \) models the average number of Russian words remembered after \( x \) days.
   a. Find and interpret \( f(1) \) and \( f(10) \)
   b. After how many days do students still remember 7 words?

Perform the indicated operations.

13. Subtract: \(\frac{3x^2}{9x^2 - 16} - \frac{x}{3x + 4}\)
14. Multiply: \(\frac{x^2 - 9x + 14}{x^3 + 2x^2} \cdot \frac{x^2 - 4}{x^2 - 4x + 4}\)
15. Simplify: \(\frac{\frac{5}{x} + 1}{1 - \frac{25}{x^2}}\)
16. Long divide: \((3x^4 - 2x^2 - 10x - 20) \div (x - 2)\)
.solve each rational equation in problems 17 – 19.

17. $\frac{3}{x} + \frac{1}{3} = \frac{5}{x}$

18. $\frac{7}{x^2 - x - 2} + \frac{1}{x + 1} - \frac{3}{x - 2} = 0$

19. $A = \frac{Rr}{R + r}$ (solve for $r$)

20. Working alone it takes you 3 hours to clean your house. It takes your roommate 6 hours working alone. How long will it take you to clean the house if you work together?