

## Part 1

1. Simplify  $5 - 2(4b - 5(b - 3))$ .

- (a)  $2b + 35$
- (b)  $35 - 18b$
- (c)  $2b - 25$
- (d)  $35 - 2b$

2. Simplify the expression  $(\sqrt{x} - \sqrt{2})^2$

- (a)  $x - 2\sqrt{2x} + 2$
- (b)  $x - 2$
- (c)  $x - 2\sqrt{x} + 2\sqrt{2} - \sqrt{x}\sqrt{2}$
- (d)  $x - 4\sqrt{x} + 4$

3. Solve the equation  $x^2 - 29 = 4x$  over the complex numbers.

- (a) There is no solution
- (b)  $2 - \sqrt{33}$  and  $2 + \sqrt{33}$
- (c)  $-3$  and  $7$
- (d)  $-25$

4. Perform the indicated operations and simplify.  $\frac{x^2 - 9}{x^2 + 7x + 12} \div \frac{x - 3}{x + 5} =$

- (a)  $\frac{x + 5}{x + 4}$
- (b)  $\frac{x^2 - 6x + 9}{9x + x^2 + 20}$
- (c)  $\frac{x - 3}{9x + x^2 + 20}$
- (d)  $\frac{x + 5}{x - 4}$

5. Solve the equation  $x^2 = 4x + 1$ .

- (a)  $-\frac{1}{2}, \sqrt{5} + 1$
- (b)  $2 - \sqrt{5}, 2 + \sqrt{5}$
- (c)  $2 - \sqrt{10}, 2 + \sqrt{10}$
- (d)  $2 + \sqrt{20}, 2 - \sqrt{20}$

6. Simplify the expression  $\frac{1 - x^{-2}}{1 + x^{-1}}$ .

- (a)  $\frac{x - 1}{x}$
- (b)  $\frac{1 - x}{x^2 + 1}$
- (c) 1
- (d)  $-\frac{1}{x - 1}$

7. Perform the indicated operations and simplify.  $\frac{1}{x - y} - \frac{1}{x + y}$

- (a) 0
- (b)  $-\frac{2}{x + y}$
- (c)  $\frac{-2y}{y^2 - x^2}$
- (d)  $\frac{2x}{y^2 - x^2}$

8. Simplify  $\frac{2^{1/2}4^{-1/2}}{64^{-2/3}}$ .

- (a)  $\sqrt{2}$
- (b)  $\frac{1}{8}\sqrt{2}$
- (c)  $-32\sqrt{2}$
- (d)  $8\sqrt{2}$

9. Find the equation of the perpendicular bisector of the line segment determined by the points  $A(-1, -5)$  and  $B(5, 7)$ .

- (a)  $y = 2x - 3$
- (b)  $y = \frac{1}{2}x - \frac{9}{2}$
- (c)  $4x - y = 13$
- (d)  $y = -\frac{1}{2}x + 2$

10. Find the area of a rectangle if its diagonal is 39 cm long and one of its sides is 15 cm long.

- (a) 292.5 cm<sup>2</sup>
- (b) 540 cm<sup>2</sup>
- (c) 585 cm<sup>2</sup>
- (d) 102 cm<sup>2</sup>

## Part 2

1. Simplify each of the following expressions. Show all work.

(a)  $2^{-2} - 2^{-3} =$

(b)  $\frac{(x^{-2})^{-2}y^3x^0(-2yxy^{-2}x^{-2})^{-3}}{yx^5(y^{-2}x)^{-3}(2x^{-1}yx^3)^{-1}} =$

(c)  $\sqrt{48x^5y^3} =$

(d)  $\sqrt{80a^{11}} - 2\sqrt{180a^{11}} + 3\sqrt{245a^{11}} =$

(e)  $\sqrt[3]{56} + 4\sqrt[3]{189} - \sqrt[3]{875} =$

(f)  $(2 - \sqrt{x})(3 + 2\sqrt{x}) =$

(g)  $\frac{\sqrt{5} - 1}{\sqrt{5} - 2} =$

(h)  $\frac{px^2 - 16q - 16p + qx^2}{x^2 + 5x + 6} \cdot \frac{x^2 + 6x + 9}{4px^2 + px^3 + 4qx^2 + qx^3} =$

2. Completely factor each of the following.

(a)  $357ab^2 - 30ab^2x - 3ab^2x^2 =$

(b)  $4a^2px^5 - 2a^2qx - 4a^2px + 2a^2qx^5 =$

3. Factor via completing the square:

(a)  $100x - x^2 - 2419 =$

(b)  $x^2 - x - 462 =$

(c)  $11x + 6x^2 - 10 =$

(d)  $x^2 - 8x + 13 =$

(e)  $x^2 - 4x + 7 =$

4. Graphing.

(a) Graph the parabola  $y = -2x^2 + 3x + 1$ . Clearly label the coordinates of at least 5 points, including vertex and intercepts.

(b) Graph the parabola  $y = 5x - 2x^2 + 3$  and the line  $y = 5x - 5$  in the same coordinate system. Use your graph to find the coordinates of the points where they intersect.

5. Solve each of the following.

(a)  $7 - (3 + 4t) + 2t = -5(1 - t) + 3 - t$

(b)  $\frac{2x - 1}{3} - \frac{-3 - x}{4} = x - 1$

(c)  $3x^3 - x^2 = x$

(d)  $5 - \sqrt{2x + 1} = -2$

## 6. Word Problems.

- (a) One side of a rectangle is 16 cm longer than the other side. The area of the rectangle is  $80 \text{ cm}^2$ . Find the dimensions of the rectangle. Include units in your answer.
- (b) The sides of a right triangle have lengths (in centimeters) that are consecutive even integers. What are the lengths of the sides?
- (c) Two investments produce an annual interest income of 708. The total amount of money invested is \$8000, and the two interest rates paid are 7% and 11%. How much money is invested at each rate?
- (d) A bank teller has 23 more five-dollar bills than ten-dollar bills. The total value of the money is \$610. How much of each denomination of bill does he have?