

Part 1

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

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

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) $x - 4\sqrt{x} + 4$ **A**.

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) $2 - 5i$ and $2 + 5i$
- (d) -25 **C**.

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) $\frac{x + 5}{x - 4}$ **A**.

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) $2 + \sqrt{20}, 2 - \sqrt{20}$ **B**

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) $-\frac{1}{x - 1}$ **A**).

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) $\frac{2x}{y^2 - x^2}$ **C**

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) $8\sqrt{2}$ **D**).

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) $y = -\frac{1}{2}x + 2$ **D**).

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 cm²
- (b) 540 cm²
- (c) 585 cm²
- (d) 102 cm² **B**).

Part 2

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

$$(a) 2^{-2} - 2^{-3} = \frac{1}{8}$$

$$(b) \frac{(x^{-2})^{-2} y^3 x^0 (-2yxy^{-2}x^{-2})^{-3}}{yx^5 (y^{-2}x)^{-3} (2x^{-1}yx^3)^{-1}} = \frac{-x^7}{4} \text{ or } -\frac{1}{4}x^7.$$

$$(c) \sqrt{48x^5y^3} = 4x^2y\sqrt{3xy}$$

$$(d) \sqrt{80a^{11}} - 2\sqrt{180a^{11}} + 3\sqrt{245a^{11}} = 13a^5\sqrt{5a}$$

$$(e) \sqrt[3]{56} + 4\sqrt[3]{189} - \sqrt[3]{875} = 9\sqrt[3]{7}$$

$$(f) (2 - \sqrt{x})(3 + 2\sqrt{x}) = 6 + \sqrt{x} - 2x$$

$$(g) \frac{\sqrt{5} - 1}{\sqrt{5} - 2} = 3 + \sqrt{5}$$

$$(h) \frac{px^2 - 16q - 16p + qx^2}{x^2 + 5x + 6} \cdot \frac{x^2 + 6x + 9}{4px^2 + px^3 + 4qx^2 + qx^3} = \frac{(x+3)(x-4)}{x^2(x+2)} = \frac{x^2 - x - 12}{2x^2 + x^3}$$

$$(i) i^{210} = -1$$

$$(j) (3 - 2i)^2 = 5 - 12i$$

$$(k) \frac{7 - 4i}{2 + i} = 2 - 3i$$

$$(l) \frac{(3 - i)^3 - (2 + i)^2}{1 - 2i} = 15$$

2. Completely factor each of the following.

$$(a) 357ab^2 - 30ab^2x - 3ab^2x^2 = -3ab^2(x + 17)(x - 7)$$

$$(b) 4a^2px^5 - 2a^2qx - 4a^2px + 2a^2qx^5 = 2a^2x(x - 1)(x + 1)(x^2 + 1)(2p + q)$$

3. Factor via completing the square:

$$(a) 100x - x^2 - 2419 = -(x - 41)(x - 59)$$

$$(b) x^2 - x - 462 = (x + 21)(x - 22)$$

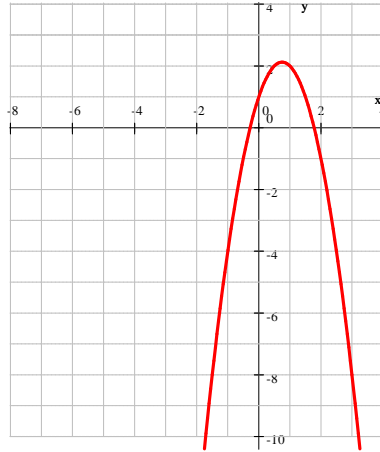
$$(c) 11x + 6x^2 - 10 = (2x + 5)(3x - 2)$$

$$(d) x^2 - 8x + 13 = (x - 4 + \sqrt{3})(x - 4 - \sqrt{3})$$

$$(e) x^2 - 4x + 7 = \text{does not factor over real numbers but } (x - 2 + \sqrt{3}i)(x - 2 - \sqrt{3}i) \text{ over complex numbers}$$

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. $(2, 5)$ and $(-2, -15)$.

5. Solve each of the following.

- (a) $7 - (3 + 4t) + 2t = -5(1 - t) + 3 - t$ 1
- (b) $\frac{2x - 1}{3} - \frac{-3 - x}{4} = x - 1$ 17
- (c) $3x^3 - x^2 = x$ $x = 0$ or $x = \frac{1 + \sqrt{13}}{6}$ or $x = \frac{1 - \sqrt{13}}{6}$
- (d) $5 - \sqrt{2x + 1} = -2$ 24

6. Word Problems.

- (a) One side of a rectangle is 16 cm longer than the other side. The area of the rectangle is 80 cm^2 . Find the dimensions of the rectangle. Include units in your answer. 4 cm by 20 cm
- (b) The sides of a right triangle have lengths (in centimeters) that are consecutive even integers. What are the lengths of the sides? 6 cm, 8 cm, and 10 cm
- (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? \$3700 at 11% and \$4300 at 7%
- (d) A bank teller has 47 more five-dollar bills than ten-dollar bills. The total value of the money is \$1000. How much of each denomination of bill does he have? 51 ten-dollar bills and 98 five-dollar bills
- (e) Two cars are 400 miles apart. Both start at the same time and travel toward one another. They meet 4 hours later. If the speed of one car is $20 \frac{\text{mi}}{\text{hr}}$ faster than the other, what is the speed of each car? The speed of the slower car is $40 \frac{\text{mi}}{\text{hr}}$ and that of the faster one is $60 \frac{\text{mi}}{\text{hr}}$.