

1. Simplify each of the following expressions.

| | | | |
|-------------|-------------------------|---------------------------|----------------------------|
| a) $(-2)^4$ | d) $(a^3)^4$ | g) $\frac{(8a)^2}{16a^3}$ | i) $\frac{-3x^4}{(-3x)^2}$ |
| b) -2^4 | e) $(2a^3)(2a)^2$ | | j) $2^{143} \cdot 2^{143}$ |
| c) a^3a^4 | f) $\frac{8a^2}{16a^3}$ | h) $(-2x)^2(-2x^2)$ | k*) $2^{143} + 2^{143}$ |

2. Simplify each of the following expressions.

| | | | | | |
|--------------------|--------------|--------------------------|------------------------------------|----------------------------------|---|
| a) $x^3 \cdot x^5$ | b) $(x^3)^5$ | c) $\frac{(x^3)^6}{x^2}$ | d) $\frac{(2x^4)^3}{2x^3 \cdot x}$ | e) $\frac{(-2x)^2 x^3}{(-2x)^5}$ | f) $\left(-\frac{2a}{3b^2}\right)^2 \left(\frac{3ab^2}{-a^2b}\right)^3$ |
|--------------------|--------------|--------------------------|------------------------------------|----------------------------------|---|

3. Simplify each of the following expressions.

| | | |
|---------------------------|------------------------------|-----------------------------------|
| a) $3(2x - 5) - 4x - 3$ | d) $(5m^3 - 2)(5m^3 + 2)$ | g) $2x - 5 - (x - 1)^2$ |
| b) $3(2x - 5) - 4(x - 3)$ | e) $(5m^3 - 2)^2$ | h) $\frac{1}{a} - \frac{a}{b}$ |
| c) $(2a - 7)(3a + 1)$ | f) $(3q - 2)^2 - 2(q - 1)^2$ | i) $3(a - 2)^2 - (2a - 1)(a + 3)$ |

4. Convert each of the following decimal to a fraction. You do NOT have to simplify the fraction.

| | | | |
|---------|----------------------|-----------------------|-----------------------|
| a) 2.04 | b) $0.\overline{24}$ | c) $4.\overline{175}$ | d) $0.1\overline{76}$ |
|---------|----------------------|-----------------------|-----------------------|

5. Completely factor each of the following.

| | | | |
|----------------|------------------------------|--------------------|-----------------|
| a) $2x^2 + 18$ | c) $9x^{10} - 49$ | e) $3a^3 - 27ab^2$ | g) $20x + 5x^3$ |
| b) $x^4 - 1$ | d) $(3a - b)^2 - (2a + b)^2$ | f) $2p^4 - 162$ | |

6. Solve each of the following equations. Make sure to check your solutions.

| | |
|--|--|
| a) $2(x - 1) - (x - 4) = 3(x + 8)$ | i) $(b + 5)(b - 2)(2b + 11) = 0$ |
| b) $\frac{3}{4}(x - 2) = \frac{2}{3}(x + 6) - 3$ | j) $\frac{x + 2}{4} - \frac{x - 3}{5} = 20 - x$ |
| c) $2(3m - 2) - 3(2m + 1) = -7$ | k) $x^5 = 4x^3$ |
| d) $\frac{3 - x}{4} - \frac{10 - 3x}{5} = x + 2$ | l) $x^5 = 4x^4$ |
| e) $(x - 1)(3x + 2) = 3(x - 2)^2 - 14$ | m) $\frac{3x + 1}{5} - \frac{2x - 1}{3} = 2x - 16$ |
| f) $y - (y - 3)^2 = 4 - (y + 1)(y - 1)$ | n) $(2x + 1)(2x - 5) = (x - 2)(4x - 1)$ |
| g) $2(a - 5) - 3(a + 2) = 5(a + 3) - 7$ | o) $(3y - 1)^2 - (y - 2)^2 = 2(2y - 1)^2 + 1$ |
| h) $\frac{2}{3}(x - 1) = \frac{3}{5}(x - 4) + 1$ | p) $2(x - 3)^2 = (x - 2)^2 + x(x - 8)$ |

7. Find all numbers such that

- If we square the number, we get back the same number.
- If we raise the number to the third power, the result is four times the original number.

8. Graph each of the following.

| | | | |
|-----------------|------------------|-------------|------------|
| a) $y = 2x - 3$ | b) $2x + 3y = 6$ | c) $x = -4$ | d) $y = 5$ |
|-----------------|------------------|-------------|------------|

9. Simplify each of the following expressions.

| | | | |
|-------------------------------------|-----------------------|---|---------------------------------------|
| a) $(3\sqrt{5} - 1)(2\sqrt{5} - 3)$ | c) $(\sqrt{3} - 1)^2$ | e) $(2\sqrt{7} + 5)(2\sqrt{7} - 5)$ | g) $(2\sqrt{7} - 3)^2$ |
| b) $\sqrt{2}(5\sqrt{2} - 3)$ | d) $(\sqrt{3} - 1)^3$ | f) $\sqrt{50} - 2\sqrt{18} + \sqrt{72}$ | h) $(2 - \sqrt{5})^3(2 + \sqrt{5})^3$ |

10. Rationalize the denominator in each of the following expressions.

a) $\frac{3}{\sqrt{2}}$ b) $\frac{1}{\sqrt{5}-2}$ c) $\frac{2}{3-\sqrt{10}}$ d) $\frac{12}{\sqrt{7}-1}$ e) $\frac{3}{\sqrt{5}-\sqrt{2}}$

11. Find the exact value of $2x^2 - 5x + 1$ if $x = 1 + \sqrt{2}$.

Answers

1. For examples with detailed solutions and more practice, see handout Exponents.

a) 16 b) -16 c) a^7 d) a^{12} e) $8a^5$ f) $\frac{1}{2a}$ g) $\frac{4}{a}$ h) $-8x^4$ i) $-\frac{x^2}{3}$ j) 2^{286} k) 2^{144}

2. For examples with detailed solutions and more practice, see handout Exponents.

a) x^8 b) x^{15} c) x^{16} d) $4x^8$ e) $-\frac{1}{8}$ f) $-\frac{12}{ab}$

3. a) $2x - 18$ b) $2x - 3$ c) $6a^2 - 19a - 7$ d) $25m^6 - 4$ e) $25m^6 - 20m^3 + 4$

f) $7q^2 - 8q + 2$ g) $-x^2 + 4x - 6$ h) $\frac{b-a^2}{ab}$ i) $a^2 - 17a + 15$

4. For examples with detailed solutions and more practice, see handout Fractions and Decimals.

a) $\frac{204}{100}$ b) $\frac{24}{99}$ c) $4\frac{175}{999} = \frac{4171}{999}$ d) $\frac{175}{990}$

5. For examples with detailed solutions and more practice, see handout Factoring A.

a) $2(x^2 + 9)$ b) $(x^2 + 1)(x + 1)(x - 1)$ c) $(3x^5 - 7)(3x^5 + 7)$ d) $5a(a - 2b)$
 e) $3a(a + 3b)(a - 3b)$ f) $2(p^2 + 9)(p + 3)(p - 3)$ g) $5x(x^2 + 4)$

6. For more examples with detailed solutions and practice, see handout Review of Linear Equations and the Zero Product Rule and Factoring A.

a) -11 b) 30 c) \mathbb{R} (all real numbers) d) -5 e) 0 f) 2 g) -4 h) -11 i) $2, -5, -\frac{11}{2}$
 j) 18 k) -2, 0, 2 l) 0, 4 m) 8 n) 7 o) 1 p) there is no solution

7. For more examples with detailed solutions and practice, see handout Factoring A.

a) 0, 1 b) -2, 0, 2

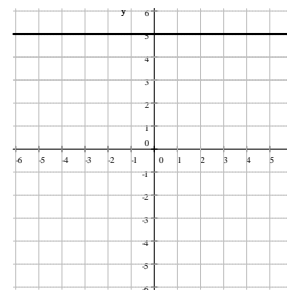
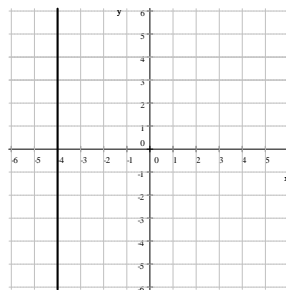
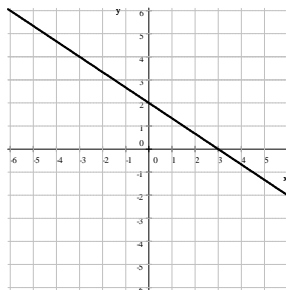
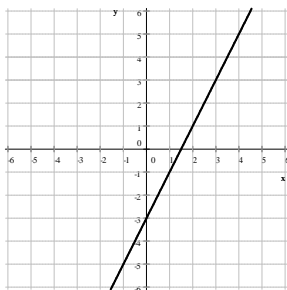
8. For more examples with detailed solutions and practice, see handout Graphing Lines.

a) $y = 2x - 3$

b) $2x + 3y = 6$

c) $x = -4$

d) $y = 5$



For problems 9-11., see handout Radical Expressions.

9. a) $33 - 11\sqrt{5}$ b) $10 - 3\sqrt{2}$ c) $4 - 2\sqrt{3}$ d) $6\sqrt{3} - 10$ e) 3 f) $5\sqrt{2}$ g) $37 - 12\sqrt{7}$ h) -1

10. a) $\frac{3\sqrt{2}}{2}$ b) $2 + \sqrt{5}$ c) $-6 - 2\sqrt{10}$ d) $2 + 2\sqrt{7}$ e) $\sqrt{2} + \sqrt{5}$ 11. $2 - \sqrt{2}$