Solutions Algebra-1
Basic Algebraic operations

Evaluation

1. $30 - 3(-1)^2(-6) = \mathbf{48}$

Simplification

2. $12x - 8 - 20x - 5 \rightarrow \mathbf{-8x - 13}$

3. $6a^2 - 15ab - 2ab + 5b^2 \rightarrow \mathbf{6a^2 - 17ab + 5b^2}$

4. $2x^2 + 6x - x - 3 + x^2 - 8x + 16$
    $$\rightarrow \mathbf{3x^2 - 3x + 13}$$

5. $(3y - 4)(3y - 4) \rightarrow \mathbf{9y^2 - 24y + 16}$

6.

	$3x^2$	$4x$	-1
$2x$	$6x^3$	$8x^x$	$-2x$
-3	$-9x^2$	$-12x$	3

$$\rightarrow \mathbf{6x^3 - x^2 - 14x + 3}$$

7. $3x(2x - 3)$

8. $(2a + 3b)(2a - 3b)$

9. a) $(3x + y)(3x - y)$

    b) $\dfrac{6x + 2y}{9x^2 - y^2} \rightarrow \dfrac{2\,(\cancel{3x+y})}{(\cancel{3x+y})(3x-y)} \rightarrow \dfrac{2}{3x-y}$

10. a) $(a + 3b)(a - 3b)$

    b) $\dfrac{a^2 - 9b^2}{2a + 6b} \rightarrow \dfrac{(\cancel{a+3b})(a-3b)}{2\,(\cancel{a+3b})} \rightarrow \dfrac{a-3b}{2}$

11. a) $(x + 3)(x - 3)$

    b) $\dfrac{4(5x+3)}{25x^2 - 9} \rightarrow \dfrac{4\,(\cancel{5x+3})}{(\cancel{5x+3})(5x-3)} \rightarrow \dfrac{4}{5x-3}$

12. $\dfrac{15x - 20}{9x^2 - 16} \rightarrow \dfrac{5\,(\cancel{3x-4})}{(3x+4)(\cancel{3x-4})} \rightarrow \dfrac{5}{3x+43}$

13. a) $2x(x - 3)$

    b) $\dfrac{2x^2 - 6x}{x^2 - 9} \rightarrow \dfrac{2x\,(\cancel{x-3})}{(x+3)(\cancel{x-3})} \rightarrow \dfrac{2x}{x+3}$

14. $3x^2 - 13x - 10 \rightarrow (3x+2)(x-5)$

15. $5 - 2 - 6x = 27 \quad -24 = 6x \quad x = -4$

16. $5 + 3a = a - 15 \quad 2a = -20 \quad a = -10$

17. $\begin{array}{l} 2a + 4b = -7 \ \dots (1) \\ 3a - 5b = 17 \ \dots (2) \end{array}$ multiply (1) x 5 and (2) x 4

    then add to get $a = 1\frac{1}{2}$, subst. to get $b = -2\frac{1}{2}$

18. $\begin{array}{l} 5a + 3b = 9 \ \dots (1) \\ 7a - 2b = 25 \ \dots (2) \end{array}$ multiply (1) x 2 and (2) x 3

    then add to get $a = 3$, subst. to get $b = -2$

Functions

1. $f(-2) = (-2)^2 - 2(-2) \rightarrow 4 + 4 \rightarrow 8$

2. $h(-2) = 15(-2) - 3(-2)^2 \rightarrow -30 - 12 \rightarrow -42$

3. $f(-3) = \dfrac{(-3)^3 + (-3)^2 + 2}{5(-3) - 1} \rightarrow \dfrac{-27 + 9 + 11}{-16} \rightarrow \dfrac{7}{16}$

4. a) $f(-3) = 9 - 6(-3) \rightarrow 9 + 18 \rightarrow 27$

    b) $f(t) = 9 - 6t \quad 11 = 9 - 6t \quad 6t = -2 \quad t = -\dfrac{1}{3}$

5. a) $f(-2) = 3(-2)^2 - 7 \rightarrow 12 - 7 \rightarrow 5$

    b) $f(a) = 3a^2 - 7 \quad 20 = 3a^2 - 7 \quad 3a^2 = 27$
        $a^2 = 9 \quad a = 3 \ or \ a = -3$

6. $f\!\left(\dfrac{1}{2}\right) = \dfrac{4}{\left(\frac{1}{2}\right)^2} \rightarrow \dfrac{4}{\frac{1}{4}} \rightarrow 4 \div \dfrac{1}{4} \rightarrow 4 \times \dfrac{4}{1} \rightarrow 16$

7. a) $f(x) = 3^x \quad f(4) = 3^4 \rightarrow 81$

    b) $\sqrt{27} = 3^x, \ \left(3^3\right)^{\frac{1}{2}} = 3^x \quad 3^{\frac{3}{2}} = 3^x \quad \therefore \ x = \dfrac{3}{2}$

8. $f(2) = \dfrac{3}{\sqrt{2}} \rightarrow \dfrac{3}{\sqrt{2}} \times \dfrac{\sqrt{2}}{\sqrt{2}} \rightarrow \dfrac{3\sqrt{2}}{2}$

9. $f(12) = 3\sqrt{12} \rightarrow 3\sqrt{4 \times 3} \rightarrow 3\sqrt{4}\sqrt{3} \rightarrow 6\sqrt{3}$

Quadratic Equations

1. $x^2 - 7x = 0 \rightarrow x(x-7) = 0 \quad x = 0, \ x = 7$

2. $6y - y^2 = 0 \quad y(6-y) = 0 \quad y = 0, \ y = 6$

3. $(2x+1)(x-5) = 0 \quad x = -\dfrac{1}{2}, \ x = 5$

4. $(2x-3)(x+5) = 0 \quad x = \dfrac{3}{2}, \ x = -5$

5. $(2x-3)(x+4) = 0 \quad x = \dfrac{3}{2}, \ x = -4$

6. $(2p-5)(p+2) = 0 \quad p = \dfrac{5}{2}, \ x = -2$

7. $5x + 3 = x^2 + 2x - 1 \rightarrow x^2 - 3x - 4 = 0$
    $$\rightarrow (x+1)(x-4) = 0 \rightarrow x = -1, \ x = 4$$