

## Polynomial Equations with Rational Solutions

1.  $y^2 - 5y - 6 = 0$

$$(y-6)(y+1) = 0$$

$y-6=0$	$y+1=0$
$+6 \quad +6$	$-1 \quad -1$
$y=6$	$y=-1$

3.  $a^2 - 8a = 20$

$$a^2 - 8a - 20 = 0$$

$$(a-10)(a+2) = 0$$

$a-10=0$	$a+2=0$
$+10 \quad +10$	$-2 \quad -2$
$a=10$	$a=-2$

5.  $n^2 = 3n + 18$

$$n^2 - 3n - 18 = 0$$

$$(n-6)(n+3) = 0$$

$n-6=0$	$n+3=0$
$+6 \quad +6$	$-3 \quad -3$
$n=6$	$n=-3$

7.  $4x^2 = 64$

$$\sqrt{4x^2} = \sqrt{64}$$

$$2x = \pm 8$$

$$x = \pm 4$$

$$x^2 - 16 = 0$$

$$(x+4)(x-4) = 0$$

$x+4=0$	$x-4=0$
$-4 \quad -4$	$+4 \quad +4$
$x=-4$	$x=4$

2.  $x^2 + 4x = 0$

$$x(x+4) = 0$$

$x=0$	$x+4=0$
	$-4 \quad -4$
	$x=-4$

4.  $3x^2 = 48$

$$\sqrt{3x^2} = \sqrt{48}$$

$$x^2 = 16$$

$$x = \pm 4$$

$$x^2 - 16 = 0$$

$$(x+4)(x-4) = 0$$

$x+4=0$	$x-4=0$
$-4 \quad -4$	$+4 \quad +4$
$x=-4$	$x=4$

6.  $2x^2 + 3x = 5$

$$2x^2 + 3x - 5 = 0$$

$$(2x+5)(x-1) = 0$$

$2x+5=0$	$x-1=0$
$-5 \quad -5$	$-1 \quad -1$
$2x = -5$	$x = 1$
$x = -\frac{5}{2}$	

8.  $4x^2 + 4x - 3 = 0$

$$x^2 + x - \frac{3}{4} = 0$$

$$(x+\frac{3}{2})(x-\frac{1}{2}) = 0$$

$2x+3=0$	$2x-1=0$
$-3 \quad -3$	$+1 \quad +1$
$2x = -3$	$2x = 1$
$x = -\frac{3}{2}$	$x = \frac{1}{2}$

$$9. \frac{8m^2}{4} + \frac{20m}{4} = \frac{12}{4}$$

$$2m^2 + 5m = 3$$

$$2m^2 + 5m - 3 = 0$$

$$2m^2 + 5m - 3 = 0$$

$$m^2 + 5m - 6$$

$$(m+6)(m-1)$$

$$11. 4x^2 - 12x = 7$$

$$4x^2 - 12x - 7 = 0$$

$$x^2 - 3x - \frac{7}{4} = 0$$

$$x^2 - 3x - 2\frac{7}{4} = 0$$

$$(x-4)(x+2) = 0$$

$$(x-\frac{7}{2})(x+\frac{1}{2}) = 0$$

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$$(x-\frac{7}{2})(x+\frac{1}{2}) = 0$$

$$(m+3)(2m-1) = 0$$

$$m+3=0 \quad 2m-1=0$$

$$-3 \quad -3 \quad +1 \quad +1$$

$$m=-3 \quad 2m=\frac{1}{2}$$

$$m=\frac{1}{2}$$

$$10. 3x^2 + 3x - 6 = 0$$

$$\frac{3x^2}{3} + \frac{3x}{3} - \frac{6}{3} = 0$$

$$x^2 + x - 2 = 0$$

$$(x+2)(x-1) = 0$$

$$x+2=0 \quad x-1=0$$

$$-2 \quad -2 \quad +1 \quad +1$$

$$x=-2 \quad x=1$$

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$$12. \frac{x^3 + 10x^2}{x^2} - \frac{9x - 90}{x} = 0$$

$$x^2(x+10) - 9(x+10) = 0$$

$$(x^2-9)(x+10) = 0$$

$$(x+3)(x-3)(x+10) = 0$$

$$x+3=0 \quad x-3=0 \quad x+10=0$$

$$-3 \quad -3 \quad -10 \quad -10$$

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$$13. 2x^4 - 6x^3 = 20x^2$$

$$-20x^2 - 20x^2$$

$$2x^4 - 6x^3 - 20x^2 = 0$$

$$\frac{2x^4}{2x^2} - \frac{6x^3}{2x^2} - \frac{20x^2}{2x^2} = 0$$

$$2x^2(x^2 - 3x - 10) = 0$$

$$2x^2(x-5)(x+2) = 0$$

$$2x^2=0 \quad x-5=0 \quad x+2=0$$

$$x=0 \quad x=5 \quad x=-2$$

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$$14. 27x^3 + 36x^2 - 12x = 16$$

$$-16 - 16$$

$$27x^3 + 36x^2 - 12x - 16 = 0$$

$$\frac{27x^3}{9x^2} + \frac{36x^2}{9x^2} - \frac{12x}{9x^2} - \frac{16}{9x^2} = 0$$

$$3x + 4 - \frac{4}{3x} - \frac{16}{9x^2} = 0$$

$$9x^2(3x+4) - 4(3x+4) = 0$$

$$(9x^2-4)(3x+4) = 0$$

$$(3x+2)(3x-2)(3x+4) = 0$$

$$3x+2=0 \quad 3x-2=0 \quad 3x+4=0$$

$$-2 \quad -2 \quad +2 \quad +2$$

$$\frac{3x}{3} = \frac{-2}{3} \quad \frac{3x}{3} = \frac{2}{3}$$

$$x = -\frac{2}{3} \quad x = \frac{2}{3}$$

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$$3x+4=0$$

$$-4 \quad -4$$

$$\frac{3x}{3} = \frac{-4}{3}$$

$$x = -\frac{4}{3}$$

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