1. 1. $x = 3$
2. $x = \sqrt{7}$
3. $x = -\sqrt{7}$
4. $x = -1/2$

3 | 2 -5 -17 35 21
↓ 6 3 -42 -21
2 1 -14 -7 0 ✓

$(2x^3 + x^2)(-14x - 7)$

$x^2(2x + 1) - 7(2x + 1)$

$(x^2 - 7)(2x + 1)$

$x^2 - 7 = 0$
$x^2 = 7$
$x = \pm\sqrt{7}$

$2x + 1 = 0$
$2x = -1$
$x = -1/2$

2. 1. $x = 2$
2. $x = 3/4$
3. $x = -5/2$

2 | 8 -2 -43 30
↓ 16 28 -30
8 14 -15 0 ✓

$8x^2 + 14x - 15$

$(4x - 3)(2x + 5)$

$4x - 3 = 0$
$4x = 3$
$x = 3/4$

$2x + 5 = 0$
$2x = -5$
$x = -5/2$

3. 1. $x = 0$
2. $x = 1$
3. $x = 3 + \sqrt{5}$
4. $x = 3 - \sqrt{5}$

0 | 1 -7 10 -4 0
↓ 0 0 0 0
1 | 1 -7 10 -4 | 0 ✓
↓ 1 -6 4
1 -6 4 0 ✓

$x^2 - 6x + 4$

$\frac{-(-6) \pm \sqrt{(-6)^2 - 4(1)(4)}}{2(1)}$

$\frac{6}{2} \pm \frac{\sqrt{20}}{2}$

$3 \pm \sqrt{5}$

4. 1. $x = -1$
2. $x = 2$
3. $x = -1$
4. $x = 2$

-1 | 1 -2 -3 4 4
↓ -1 3 0 -4
2 | 1 -3 0 4 | 0 ✓
↓ 2 -2 -4
1 -1 -2 0 ✓

$x^2 - x - 2$

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

$x + 1 = 0$
$x = -1$

$x - 2 = 0$
$x = 2$

5. 1. $x = 1$
2. $x = -3 + \sqrt{6}$
3. $x = -3 - \sqrt{6}$

1 | 1 5 -3 -3
↓ 1 6 3
1 6 3 0 ✓

$x^2 + 6x + 3$

$\frac{-(6) \pm \sqrt{(6)^2 - 4(1)(3)}}{2(1)}$

$\frac{-6}{2} \pm \frac{\sqrt{24}}{2}$

$-3 \pm \sqrt{6}$

6. 1. $x = -4$
2. $x = 1$
3. $x = \sqrt{5}$
4. $x = -\sqrt{5}$

-4 | 1 3 −9 −15 20
↓ −4 4 20 −20
1 | 1 −1 −5 5 | 0 ✓
↓ 1 0 −5
1 0 −5 0 ✓

$x^2 - 5$

$x^2 - 5 = 0$
$x^2 = 5$
$x = \pm\sqrt{5}$

7. 1. $x = -2$
2. $x = 1/2$
3. $x = -1/2$

-2 | 4 8 −1 −2
↓ −8 0 2
4 0 −1 0 ✓

$4x^2 - 1$

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

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

8. 1. $x = -5$
2. $x = 1/4$
3. $x = -1/2$

-5 | 8 42 9 −5
↓ −40 −10 5
8 2 −1 0 ✓

$8x^2 + 2x - 1$

$(4x-1)(2x+1)$

$4x-1=0$ $\quad$ $2x+1=0$
$4x=1$ $\quad$ $2x=-1$
$x=1/4$ $\quad$ $x=-1/2$

9. 1. $x = 1$
2. $x = -2$
3. $x = -3/4$

1 | 4 7 −5 −6
↓ 4 11 6
-2 | 4 11 6 | 0 ✓
↓ −8 −6
4 3 0 ✓

$4x + 3$

$4x+3=0$
$4x=-3$
$x=-3/4$

10. 1. $x = 0$
2. $x = 0$
3. $x = 1+\sqrt{3}$
4. $x = 1-\sqrt{3}$

0 | 1 −2 −2 0 0
↓ 0 0 0 0
1 −2 −2 0 0 ✓

$x^3 - 2x^2 - 2x$

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

$\frac{-(-2) \pm \sqrt{(-2)^2 - 4(1)(-2)}}{2(1)}$

$\frac{2}{2} \pm \frac{\sqrt{12}}{2} = 1 \pm \sqrt{3}$

11. 1. $x = -2$
2. $x = -1/3$
3. $x = 1/2$

-2 | 6 11 −3 −2
↓ −12 2 2
6 −1 −1 0 ✓

$6x^2 - x - 1$

$(3x+1)(2x-1)$

$3x+1=0$ $\quad$ $2x-1=0$
$3x=-1$ $\quad$ $2x=1$
$x=-1/3$ $\quad$ $x=1/2$

12. 1. $x = 3$
2. $x = 2+\sqrt{2}$
3. $x = 2-\sqrt{2}$

3 | 1 −7 14 −6
↓ 3 −12 6
1 −4 2 0 ✓

$x^2 - 4x + 2$

$\frac{-(-4) \pm \sqrt{(-4)^2 - 4(1)(2)}}{2(1)}$

$\frac{4}{2} \pm \frac{\sqrt{8}}{2} = 2 \pm \sqrt{2}$