Recurrence Relation Problems

1. $a_n - 2a_{n-1} = 0$; $a_0 = 3$.
2. $a_n = 6a_{n-1} + 3$; $a_0 = -8/5$.
3. $a_n + 3a_{n-1} = n + 2$; $a_0 = 37/16$.
4. $2a_n - a_{n-1} - 2^n = 0$; $a_0 = 1$.
5. $3a_n = -2a_{n-1} + 3n4^n$; $a_0 = 2$.
6. $a_n - 6n - 10 = a_{n-1}$; $a_0 = -3$.
7. $a_n = 3a_{n-1} + 2 \cdot 3^n$; $a_0 = 10$.
8. $a_n - 2a_{n-1} = -4n2^n$; $a_0 = 5$.
9. $a_n + 4a_{n-1} = 10n^2 + 1$; $a_0 = 1$.
10. $a_n + a_{n-1} - 4n(-1)^n = 0$; $a_0 = -3$.

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11. $a_n - 5a_{n-1} + 6a_{n-2} = 0$; $a_0 = 5$; $a_1 = 12$.
12. $a_n = 5a_{n-1} - 4a_{n-2} + 28n$; $a_0 = 0$; $a_1 = -136/7$.
13. $a_n + a_{n-1} = 6a_{n-2}$; $a_0 = 10$; $a_1 = 0$.
14. $a_n - a_{n-2} + 2^n$; $a_0 = 1$; $a_1 = 1$.
15. $a_n - 72n^2 + 5a_{n-1} + 6a_{n-2} = 0$; $a_0 = 175/12$; $a_1 = 451/12$.
16. $2a_n + 3a_{n-2} = 7a_{n-1} + 9n2^n$; $a_0 = -32$; $a_1 = -181/2$.
17. $6a_n + a_{n-1} = 2a_{n-2} + 5n + 13$; $a_0 = 3$; $a_1 = 35/6$.
18. $a_n + 4a_{n-1} - 45 + 4a_{n-2} = 0$; $a_0 = 10$; $a_1 = -3$.
19. $a_n + 9a_{n-2} = 6a_{n-1} + 8$; $a_0 = 2$; $a_1 = 20$.
20. $a_n = -a_{n-2}$; $a_0 = 2$; $a_1 = 0$.
21. $a_n = 2a_{n-1} + a_{n-2} + 4(-1)^n$; $a_0 = 4$; $a_1 = -4$.
22. $a_n + 2a_{n-2} = 2a_{n-1} + 25n3^n$; $a_0 = 22$; $a_1 = 67$.
23. $a_n - 8a_{n-1} + 15a_{n-2} = 12 \cdot 3^n$; $a_0 = 0$; $a_1 = -8$.
24. $a_n + 5 + 2a_{n-2} = 3a_{n-1} + 2n$; $a_0 = -1$; $a_1 = 2$.
25. $a_n - 2a_{n-1} + a_{n-2} = 6n - 10$; $a_0 = 2$; $a_1 = 2$.
26. $a_n = 4a_{n-1} - 4a_{n-2} + 6 \cdot 2^n$; $a_0 = 5$; $a_1 = 16$.

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27. $a_n - 3a_{n-1} + 3a_{n-2} - a_{n-3} = 88n - 30$; $a_0 = 1$; $a_1 = 3$; $a_2 = 25$.
28. $a_n - a_{n-4} = 0$; $a_0 = 4$; $a_1 = 2$; $a_2 = 4$; $a_3 = 2$.
29. $a_n - 5a_{n-1} + 8a_{n-2} - 4a_{n-3} = 2^n$ $a_0 = 0$; $a_1 = 0$; $a_2 = 8$.
30. $a_n - 2a_{n-2} + a_{n-4} = 0$; $a_0 = 2$; $a_1 = 0$; $a_2 = 6$; $a_3 = 0$.

Homogenuous Problem	--	Forcing Function
1. $a_n - 2a_{n-1} = 0;$		0.
2. $a_n - 6a_{n-1} = 0;$		3.
3. $a_n + 3a_{n-1} = 0;$		$n + 2.$
4. $2a_n - a_{n-1} = 0;$		$2^n.$
5. $3a_n + 2a_{n-1} = 0;$		$3n4^n.$
6. $a_n - a_{n-1} = 0;$		$6n + 10.$
7. $a_n - 3a_{n-1} = 0;$		$2{\cdot}3^n.$
8. $a_n - 2a_{n-1} = 0;$		$-4n2^n.$
9. $a_n + 4a_{n-1} = 0;$		$10n^2 + 1.$
10. $a_n + a_{n-1} = 0;$		$4n(-1)^n.$
11. $a_n - 5a_{n-1} + 6a_{n-2} = 0;$		0.
12. $a_n - 5a_{n-1} + 4a_{n-2} = 0;$		28n.
13. $a_n + a_{n-1} - 6a_{n-2} = 0;$		0.
14. $a_n - a_{n-2} = 0;$		$2^n.$
15. $a_n + 5a_{n-1} + 6a_{n-2} = 0;$		$72n^2.$
16. $2a_n - 7a_{n-1} + 3a_{n-2} = 0;$		$9n2^n.$
17. $6a_n + a_{n-1} - 2a_{n-2} = 0;$		$5n + 13$
18. $a_n + 4a_{n-1} + 4a_{n-2} = 0;$		45.
19. $a_n - 6a_{n-1} + 9a_{n-2} = 0;$		8.
20. $a_n + a_{n-2} = 0;$		0.
21. $a_n - 2a_{n-1} - a_{n-2} = 0;$		$4(-1)^n.$
22. $a_n - 2a_{n-1} + 2a_{n-2} = 0;$		$25n3^n.$
23. $a_n - 8a_{n-1} + 15a_{n-2} = 0;$		$12{\cdot}3^n.$
24. $a_n - 3a_{n-1} + 2a_{n-2} = 0;$		$2n - 5.$
25. $a_n - 2a_{n-1} + a_{n-2} = 0;$		$6n - 10.$
26. $a_n - 4a_{n-1} + 4a_{n-2} = 0;$		$6{\cdot}2^n.$
27. $a_n - 3a_{n-1} + 3a_{n-2} - a_{n-3} = 0;$		$88n - 30.$
28. $a_n - a_{n-4} = 0;$		0.
29. $a_n - 5a_{n-1} + 8a_{n-2} - 4a_{n-3} = 0;$		$2^n.$
30. $a_n - 2a_{n-2} + a_{n-4} = 0;$		0.

Characteristic Poly	Roots	General Homo Solution
1. $x - 2 = 0;$	2	$a_n = A2^n.$
2. $x - 6 = 0;$	6	$a_n = A6^n.$
3. $x + 3 = 0;$	-3	$a_n = A(-3)^n.$
4. $2x - 1 = 0;$	1/2	$a_n = A(1/2)^n.$
5. $3x + 2 = 0;$	-2/3	$a_n = A(-2/3)^n.$
6. $x - 1 = 0;$	1	$a_n = A.$
7. $x - 3 = 0;$	3	$a_n = A3^n.$
8. $x - 2 = 0;$	2	$a_n = A2^n.$
9. $x + 4 = 0;$	-4	$a_n = A(-4)^n.$
10. $x + 1 = 0;$	-1	$a_n = A(-1)^n.$
11. $x^2 - 5x + 6 = 0;$	2, 3	$a_n = A2^n + B3^n.$
12. $x^2 - 5x + 4 = 0;$	1, 4	$a_n = A + B4^n.$
13. $x^2 + x - 6 = 0;$	2, -3	$a_n = A2^n + B(-3)^n.$
14. $x^2 - 1 = 0;$	1, -1	$a_n = A + B(-1)^n.$
15. $x^2 + 5x + 6 = 0;$	-2, -3	$a_n = A(-2)^n + B(-3)^n.$
16. $2x^2 - 7x + 3 = 0;$	1/2, 3	$a_n = A(1/2)^n + B3^n.$
17. $6x^2 + x - 2 = 0;$	1/2, -2/3	$a_n = A(1/2)^n + B(-2/3)^n.$
18. $x^2 + 4x + 4 = 0;$	-2, -2	$a_n = A(-2)^n + Bn(-2)^n.$
19. $x^2 - 6x + 9 = 0;$	3, 3	$a_n = A3^n + Bn3^n.$
20. $x^2 + 1 = 0;$	i, -i	$a_n = Ai^n + B(-i)^n.$
21. $x^2 - 2x - 1 = 0;$	$1 \pm \sqrt{2}$	$a_n = A(1+\sqrt{2})^n + B(1-\sqrt{2})^n.$
22. $x^2 - 2x + 2 = 0;$	$1 \pm i$	$a_n = A(1+i)^n + B(1-i)^n.$
23. $x^2 - 8x + 15 = 0;$	3, 5	$a_n = A3^n + B5^n.$
24. $x^2 - 3x + 2 = 0;$	1, 2	$a_n = A + B2^n.$
25. $x^2 - 2x + 1 = 0;$	1, 1	$a_n = A + Bn.$
26. $x^2 - 4x + 4 = 0;$	2, 2	$a_n = A2^n + Bn2^n.$
27. $x^3 - 3x^2 + 3x - 1 = 0;$	1, 1, 1	$a_n = A + Bn + Cn^2$
28. $x^4 - 1 = 0;$	$\pm 1, \pm i$	$a_n = A + B(-1)^n + Ci^n + D(-i)^n.$
29. $x^3 - 5x^2 + 8x - 4 = 0;$	1, 2, 2	$a_n = A + B2^n + Cn2^n.$
30. $x^4 - 2x^2 + 1 = 0;$	$\pm 1, \pm 1$	$a_n = A + B(-1)^n + Cn + Dn(-1)^n.$

Particular Solution--Guess and Answer

1. $a_n = 0$; (it's homo)	$a_n = 0$.
2. $a_n = A$;	$a_n = -3/5$.
3. $a_n = An + B$;	$a_n = (1/4)n + 5/16$.
4. $a_n = A2^n$;	$a_n = (2/3)2^n$.
5. $a_n = An4^n + B4^n$;	$a_n = (6/7)n4^n + (6/49)4^n$.
6. $a_n = n(An + B)$;	$a_n = 3n^2 - 7n$.
7. $a_n = An3^n$;	$a_n = 2n3^n$.
8. $a_n = n(An2^n + B2^n)$;	$a_n = -2n^2 2^n + 2n2^n$.
9. $a_n = An^2 + Bn + C$;	$a_n = 2n^2 + (16/5)n - 19/25$.
10. $a_n = n(An(-1)^n + B(-1)^n)$;	$a_n = 2n^2(-1)^n + 2n(-1)^n$.

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11. $a_n = 0$; (it's homo)	$a_n = 0$.
12. $a_n = n(An + B)$;	$a_n = -2n^2 - (38/7)n$.
13. $a_n = 0$; (it's homo)	$a_n = 0$.
14. $a_n = A2^n$;	$a_n = (4/3)2^n$.
15. $a_n = An^2 + Bn + C$;	$a_n = 6n^2 + 17n + 175/12$.
16. $a_n = An2^n + B2^n$;	$a_n = -12n2^n - 32 \cdot 2^n$.
17. $a_n = An + B$;	$a_n = n + 2$.
18. $a_n = A$;	$a_n = 5$.
19. $a_n = A$;	$a_n = 2$.
20. $a_n = 0$; (it's homo)	$a_n = 0$.
21. $a_n = A(-1)^n$;	$a_n = 2(-1)^n$.
22. $a_n = An3^n + B3^n$;	$a_n = 45n3^n - 18 \cdot 3^n$.
23. $a_n = n(A3^n)$;	$a_n = -2n3^n$.
24. $a_n = n(An + B)$;	$a_n = -n^2$.
25. $a_n = n^2(An + B)$;	$a_n = n^3 - 2n^2$.
26. $a_n = An^2 2^n$;	$a_n = 3n^2 2^n$.

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27. $a_n = n^2(An + B)$;	$a_n = n^4 + n^3$.
28. $a_n = 0$; (it's homo)	$a_n = 0$.
29. $a_n = An^2 2^n$;	$a_n = n^2 2^n$.
30. $a_n = 0$; (it's homo)	$a_n = 0$.

General Solution	Initial Value Solutions
1. $a_n = A2^n$.	$A = 3$.
2. $a_n = A6^n - 3/5$.	$A = -1$.
3. $a_n = A(-3)^n + (1/4)n + 5/16$.	$A = 2$.
4. $a_n = A(1/2)^n + (2/3)2^n$.	$A = 1/3$.
5. $a_n = A(-2/3)^n + (6/7)n4^n + (6/49)4^n$.	$A = 92/49$.
6. $a_n = A + 3n^2 - 7n$.	$A = -3$.
7. $a_n = A3^n + 2n3^n$.	$A = 10$.
8. $a_n = A2^n - 2n^2 2^n + 2n2^n$.	$A = 5$.
9. $a_n = A(-4)^n + 2n^2 + (16/5)n - 19/25$.	$A = 31/25$.
10. $a_n = A(-1)^n + 2n^2(-1)^n + 2n(-1)^n$.	$A = -3$.

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11. $a_n = A2^n + B3^n$.	$A = 3$;	$B = 2$.
12. $a_n = A + B4^n - 2n^2 - (38/7)n$.	$A = 4$;	$B = -4$.
13. $a_n = A2^n + B(-3)^n$.	$A = 6$;	$B = 4$.
14. $a_n = A + B(-1)^n + (4/3)2^n$.	$A = -1$;	$B = 2/3$.
15. $a_n = A(-2)^n + B(-3)^n + 6n^2 + 17n + 175/12$.	$A = 0$;	$B = 0$.
16. $a_n = A(1/2)^n + B3^n - 12n2^n - 32\cdot 2^n$.	$A = 1$;	$B = -1$.
17. $a_n = A(1/2)^n + B(-2/3)^n + n + 2$.	$A = 3$;	$B = -2$.
18. $a_n = A(-2)^n + Bn(-2)^n + 5$.	$A = 5$;	$B = -1$.
19. $a_n = A3^n + Bn3^n + 2$.	$A = 0$;	$B = 6$.
20. $a_n = Ai^n + B(-i)^n$.	$A = 1$;	$B = 1$.
21. $a_n = A(1+\sqrt{2})^n + B(1-\sqrt{2})^n + 2(-1)^n$.	$A = 1-\sqrt{2}$;	$B = 1+\sqrt{2}$.
22. $a_n = A(1+i)^n + B(1-i)^n + 45n3^n - 18\cdot 3^n$.	$A = 2$;	$B = 2$;
23. $a_n = A3^n + B5^n - 2n3^n$.	$A = 1$;	$B = -5$.
24. $a_n = A + B2^n - n^2$.	$A = -2$;	$B = 1$.
25. $a_n = A + Bn + n^3 - 2n^2$.	$A = 2$;	$B = 1$.
26. $a_n = A2^n + Bn2^n + 3n^2 2^n$.	$A = 5$;	$B = 0$.

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27. $a_n = A + Bn + Cn^2 + n^4 + n^3$.	$A = 1$;	$B = 0$;	$C = 0$.
28. $a_n = A + B(-1)^n + Ci^n + D(-i)^n$.	$A = 3$;	$B = 1$;	$C = 0$; $D = 0$.
29. $a_n = A + B2^n + Cn2^n + n^2 2^n$.	$A = 0$;	$B = 0$;	$C = -1$.
30. $a_n = A + B(-1)^n + Cn + Dn(-1)^n$.	$A = 1$;	$B = 1$;	$C = 1$; $D = 1$.