

Из целевых функций a и ограничений b , приведенных ниже, сформировать задачи выпуклого программирования и решить их.

а) Целевые функции:

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| 1. $f = x_1^2 + x_2^2 + 6$ | 2. $f = 5x_1^2 + x_2^2$ | 3. $f = x_1^2 + x_1 - x_2$ |
| 4. $f = 10x_1^2 - x_2$ | 5. $f = x_2^2 + x_1 - 4x_2$ | 6. $f = 2x_1^2 + 3x_2^2$ |
| 7. $f = x_1^2 + x_2 - 5$ | 8. $f = x_1^2 + \frac{1}{2}x_2^2$ | 9. $f = x_1^6 + 7x_2 + 1$ |
| 10. $f = 4x_1^2 + x_2^2 - x_1x_2 - 4$ | 11. $f = 2x_1^4 + 3x_2 - 1$ | 12. $f = 3x_1^2 + \frac{1}{2}x_2^2 - x_1x_2 + 1$ |
| 13. $f = x_1^6 - x_1 + x_2$ | 14. $f = 4x_1^2 + x_2^2 - x_1$ | 15. $f = x_1^2 + 2x_2^2 + x_1x_2$ |
| 16. $f = x_1^2 + x_2^2 - 4x_2$ | 17. $f = 2x_1^2 - 4x_2 - x_1$ | 18. $f = x_1^2 + 3x_2^2 - x_1x_2$ |
| 19. $f = x_1^2 + x_2^2 - x_1 + x_2$ | 20. $f = x_1^2 + \frac{1}{2}x_2^2 - \frac{1}{4}x_1x_2$ | 21. $f = \frac{1}{2}x_1^2 - \frac{1}{4}x_2$ |
| 22. $f = 2x_1^2 + \frac{1}{2}x_2^2 - \frac{1}{4}x_1$ | 23. $f = 3x_1^2 + x_2^2 + x_2$ | 24. $f = e^{x_1+x_2} + 4$ |
| 25. $f = 3x_2^2 + 4x_1$ | 26. $f = 4x_1^2 - 8x_1 + x_2$ | 27. $f = \frac{1}{2}x_1^2 + \frac{3}{2}x_2^2 - x_1$ |
| 28. $f = 2x_1^2 + x_2^2 + x_1x_2$ | 29. $f = 2x_2^2 + 10$ | 30. $f = x_2^2 + x_2^2 - \frac{1}{2}x_1x_2$ |
| 31. $f = \frac{1}{2}x_1^2 + 3x_2^2 - x_1$ | 32. $f = x_2^2 - x_1$ | 33. $f = x_1^2 - x_2 + x_1$ |
| 34. $f = 2x_1^2 + x_2 + x_1$ | 35. $f = x_1^2 + x_2^2 - 2x_1$ | 36. $f = 3x_2^2 - x_1x_2 + x_1$ |
| 37. $f = e^{x_1} + e^{x_2} - 1$ | 38. $f = 2x_1^2 + \frac{1}{2}x_1 - 2x_2$ | 39. $f = x_1^2 + 2x_2^2 - x_1x_2$ |
| 40. $f = x_1^4 + x_2^2 + 10$ | | |

б) Ограничения:

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| 1. $2x_1 - 6x_2 - 12 \leq 0,$
$3x_1 + 8x_2 - 24 \leq 0,$
$x_1 \geq 0, \quad x_1 \geq 0.$ | 2. $-x_1 + 3x_2 - 7 \leq 0,$
$x_1 + x_2 \leq 0,$
$x_2 \geq 0.$ |
| 3. $-3x_1 + 2x_2 \leq 6,$
$x_1 - x_2 \leq 2,$
$x_1 \geq 0.$ | 4. $-4x_1 + 3x_2 \leq 6,$
$x_1 - x_2 \leq 2,$
$x_2 \geq 0.$ |
| 5. $-2x_1 + x_2 \leq 2,$
$x_1 + x_2 \leq 3,$
$x_1 \geq 0.$ | 6. $-5x_1 + 3x_2 \leq 15,$
$x_1 - 2x_2 \leq 4,$
$x_1 \geq 0, \quad x_2 \geq 0.$ |
| 7. $x_1 - x_2 \leq 4,$
$-3x_1 + x_2 \leq 3,$
$x_2 \geq 0.$ | 8. $x_1 - x_2 \leq 5,$
$-7x_1 + 2x_2 \leq 14,$
$x_1 \geq 0, \quad x_2 \geq 0.$ |

$$\begin{aligned} 9. \quad & x_1 - 2x_2 \leq 3, \\ & -4 \leq x_1 \leq 3. \end{aligned}$$

$$\begin{aligned} 11. \quad & -2x_1 + 3x_2 \leq 7, \\ & x_1 - 25x_2 \leq 0, \\ & x_2 \geq 0. \end{aligned}$$

$$\begin{aligned} 13. \quad & 2x_1 + x_2 \leq 6, \\ & 2x_1 + x_2 \geq 2, \\ & x_1 \geq 0. \end{aligned}$$

$$\begin{aligned} 15. \quad & x_1 + x_2 \geq 1, \\ & -9x_1 + 3x_2 \leq 9, \\ & x_2 \geq 0. \end{aligned}$$

$$\begin{aligned} 17. \quad & 2x_1 - 5x_2 \leq 20, \\ & -1 \leq x_1 \leq 5. \end{aligned}$$

$$\begin{aligned} 19. \quad & 2x_1 - 5x_2 \geq 2, \\ & 5x_1 + 2x_2 \leq 10, \\ & 0 \leq x_1 \leq \frac{3}{2}. \end{aligned}$$

$$\begin{aligned} 21. \quad & x_1 + x_2 \geq 4, \\ & 8x_1 + x_2 \leq 48, \\ & 3 \leq x_1 \leq 6. \end{aligned}$$

$$\begin{aligned} 23. \quad & x_1 - x_2 \geq 2, \\ & -4x_1 - 3x_2 \leq 12, \\ & 0 \leq x_1 \leq 3. \end{aligned}$$

$$\begin{aligned} 25. \quad & 3x_1 + 2x_2 \leq 6, \\ & -3x_1 - x_2 \leq -3, \\ & -\frac{1}{2} \leq x_2 \leq 2. \end{aligned}$$

$$\begin{aligned} 27. \quad & 2x_1 + x_2 \leq 4, \\ & x_1 \leq \frac{3}{2}, \\ & 0 \leq x_2 \leq \frac{5}{2}. \end{aligned}$$

$$\begin{aligned} 10. \quad & x_1 - 3x_2 \leq 6, \\ & -\frac{1}{2} \leq x_1 \leq 3. \end{aligned}$$

$$\begin{aligned} 12. \quad & x_1 - x_2 \leq 5, \\ & -7x_1 + 2x_2 \leq 14, \\ & x_1 \geq 0, \quad x_2 \geq 0. \end{aligned}$$

$$\begin{aligned} 14. \quad & 3x_1 + 4x_2 \geq 12, \\ & 5x_1 + 2x_2 \geq 10, \\ & 4x_1 + x_2 \leq 20, \\ & x_1 \geq 0. \end{aligned}$$

$$\begin{aligned} 16. \quad & x_1 - 3x_2 \leq 3, \\ & 4x_1 + 2x_2 \geq 8, \\ & -6x_1 + 7x_2 \leq 42. \end{aligned}$$

$$\begin{aligned} 18. \quad & x_1 - 2x_2 \geq 1, \\ & x_1 - x_2 \geq -1. \end{aligned}$$

$$\begin{aligned} 20. \quad & x_1 + 2x_2 \leq 2, \\ & x_1 + x_2 \geq 1, \\ & \frac{3}{4} \leq x_1 \leq \frac{3}{2}. \end{aligned}$$

$$\begin{aligned} 22. \quad & -3x_1 + 5x_2 \geq -15, \\ & 3x_1 + x_2 \geq 3, \\ & x_1 \geq 0. \end{aligned}$$

$$\begin{aligned} 24. \quad & 2x_1 + 3x_2 \leq 12, \\ & 2x_1 + x_2 \leq 10, \\ & -1 \leq x_1 \leq 5. \end{aligned}$$

$$\begin{aligned} 26. \quad & -x_1 + x_2 \leq 1, \\ & 3x_1 + 2x_2 \leq 6, \\ & -\frac{1}{2} \leq x_2 \leq \frac{3}{2}. \end{aligned}$$

$$\begin{aligned} 28. \quad & x_1 - 3x_2 \leq 3, \\ & x_1 - x_2 \leq 4, \\ & x_1 \geq 0, \quad x_2 \leq 2. \end{aligned}$$

29. $3x_1 + 4x_2 \leq 12,$
 $-x_1 + x_2 \leq 2,$
 $0 \leq x_2 \leq \frac{5}{2}.$
30. $2x_1 + 6x_2 \leq 6,$
 $-3x_1 - 4x_2 \leq 4,$
 $x_1 - 4x_2 \leq 4,$
 $x_2 \leq \frac{3}{2}.$
31. $x_1^2 + x_2^2 + 2x_1 - 4x_2 \leq 4,$
 $x_1 \geq 0, \quad x_2 \geq 0.$
32. $x_1^2 + x_2 \leq 4,$
 $x_1 + x_2 \leq 8,$
 $x_1 \geq 0.$
33. $x_1^2 + x_1 \leq 3,$
 $2x_1 + x_2 \leq 5,$
 $x_2 \geq 0.$
34. $x_1^2 + x_2^2 - 2x_1 + 8x_2 \leq -16,$
 $x_1 - x_2 \leq 5.$
35. $x_1^2 - 4x_1 - x_2 \leq -5,$
 $-x_1^2 + 6x_1 - x_2 \leq 7.$
36. $x_1^2 + x_2^2 - 4x_2 \leq 0,$
 $x_1 x_2 \geq 0,$
 $x_1 \geq 1.$
37. $2x_1^2 + 9x_2^2 \leq 8,$
 $-x_1 - x_2 \leq 1,$
 $x_2 \geq 0.$
38. $x_1^2 + 4x_2^2 \leq 16,$
 $x_1 x_2 - 1 \geq 0,$
 $x_1 \geq 0.$
39. $3x_1^2 - 6x_1 - x_2 \leq 2,$
 $x_1^2 + x_2^2 \leq 9,$
 $x_1 \geq 0, \quad x_2 \geq 0.$
40. $3x_1 - x_2 \leq -1,$
 $x_2^2 \leq 2.$
41. $3x_1^2 \leq 15,$
 $-x_1 - 5x_2 \geq -10,$
 $x_1 \geq 0, \quad x_2 \geq 0.$
42. $x_1^2 + x_2^2 \leq 3,$
 $3x_1^2 + x_2 \leq 4,$
 $x_1 \geq 0, \quad x_2 \geq 0.$
43. $x_1^2 \leq 25,$
 $x_1 + 2x_2 \leq 5,$
 $x_2 \geq 0.$
44. $x_1^2 - x_2 \leq 5,$
 $x_1 + x_2 \leq 3,$
 $x_1 \geq 0.$
45. $2x_1^2 + x_2^2 + x_1 \leq 8,$
 $x_1 + x_2 \leq 5,$
 $x_1 \geq 0.$
46. $x_1^2 - x_2 + x_3 \leq 5,$
 $x_1 + 5x_2 \geq 8,$
 $x_1 \geq 0, \quad x_2 \geq 0.$
47. $2x_1^2 + x_2^2 + x_1 \leq 8,$
 $x_1 + x_2 \leq 5,$
 $x_1 \geq 0, \quad x_2 \geq 0.$
48. $x_1^2 + x_2^2 + x_1 x_2 \leq 10,$
 $x_1 + 2x_2 = 4,$
 $x_1 \geq 0, \quad x_2 \geq 0.$

$$\begin{aligned} 49. \quad & x_1^2 + x_2^2 \leq 10, \\ & x_1^2 \leq 5, \\ & x_2 \geq 0. \end{aligned}$$

$$\begin{aligned} 51. \quad & x_1^2 \leq 6, \\ & x_2^2 \leq 9, \\ & x_1 + x_2 \leq 6, \\ & x_2 \geq 0. \end{aligned}$$

$$\begin{aligned} 53. \quad & x_1^2 + x_1^2 \leq 10, \\ & x_2 - 2x_1 = 5. \end{aligned}$$

$$\begin{aligned} 55. \quad & 2x_1^2 + x_2^2 + 2x_1 - 4x_2 \leq 4, \\ & x_1 \geq 0, \quad x_2 \geq 0. \end{aligned}$$

$$\begin{aligned} 57. \quad & x_1^2 + x_2^2 \leq 25, \\ & x_1 x_2 \geq 4, \\ & x_1 \geq 0, \quad x_2 \geq 0. \end{aligned}$$

$$\begin{aligned} 59. \quad & x_1^2 + x_2^2 - 4x_2 \leq 0, \\ & -x_1 - x_2 \leq 1, \\ & x_2 \geq 0. \end{aligned}$$

$$\begin{aligned} 50. \quad & x_1^2 + x_2^2 \leq 9, \\ & x_1 + x_2 \leq 6, \\ & x_1 \geq 0, \quad x_2 \geq 0. \end{aligned}$$

$$\begin{aligned} 52. \quad & 2x_1 + x_2^2 \leq 8, \\ & x_1 - 2x_2 \leq 10, \\ & x_1 + x_2 \leq 5. \end{aligned}$$

$$\begin{aligned} 54. \quad & x_1^2 + 3x_2^2 + 2x_1 \leq 3, \\ & x_1 \geq 0, \quad x_2 \geq 0. \end{aligned}$$

$$\begin{aligned} 56. \quad & 4x_1^2 - x_1 x_2 \leq 9, \\ & x_1 + x_2 \leq 4, \\ & x_1 \geq 0, \quad x_2 \geq 0. \end{aligned}$$

$$\begin{aligned} 58. \quad & x_1^2 + x_2^2 \leq 4, \\ & x_1 + x_2 = 1. \end{aligned}$$

$$\begin{aligned} 60. \quad & 4x_1^2 + x_1 x_2 \leq 10, \\ & x_1 - x_2 \leq 3, \\ & x_1 \geq 0, \quad x_2 \geq 0. \end{aligned}$$