Calculus 3 Workbook

Lagrange multipliers

krista king MATH

TWO DIMENSIONS, ONE CONSTRAINT

■ 1. Use Lagrange multipliers to find the extrema of the function, subject to the given constraint.

$$f(x, y) = x + y - 5$$

$$xy = 1$$

■ 2. Use Lagrange multipliers to find the extrema of the function, subject to the given constraint.

$$f(x, y) = e^{2x+y}$$

$$x^2 + y^2 = 5$$

■ 3. Use Lagrange multipliers to find the extrema of the function, subject to the given constraint.

$$f(x, y) = x^2 + y^2 + 3$$

$$\sin(x + y) = 0$$

■ 4. Use Lagrange multipliers to find the extrema of the function, subject to the given constraint.

$$f(x,y) = \ln \frac{2x-4}{y^2}$$

$$4x + 8y - 15 = 0$$

THREE DIMENSIONS, ONE CONSTRAINT

■ 1. Use Lagrange multipliers to find the local extrema of the function, subject to the given constraint.

$$f(x, y, z) = x^5 - 160y + 160z$$

$$x + y^2 + z^2 = 0$$

■ 2. Use Lagrange multipliers to find the extrema of the function, subject to the given constraint.

$$f(x, y, z) = x + 2y^2 - 3z^2 - 4$$

$$e^x + y - 3z = -\frac{1}{4}$$

■ 3. Use Lagrange multipliers to find the local extrema of the function, subject to the given constraint.

$$f(x, y, z) = |x^3 y^7 z^5|$$

$$3x + 7y + 5z = 60$$

■ 4. Use Lagrange multipliers to find the local extrema of the function, subject to the given constraint.

$$f(x, y, z) = x + yz + 2y$$

$$y^2 + xyz = 2$$

■ 5. Use Lagrange multipliers to find the extrema of the function, subject to the given constraint.

$$f(x, y, z) = \ln \frac{xy + 3y}{z - 2}$$

$$x + y + 3z = 6$$

■ 6. Use Lagrange multipliers to find the local extrema of the function, subject to the given constraint.

$$f(x, y, z) = \sin^2 x \cdot \sin 2y \cdot \sin z$$

$$2x + 2y + z = \frac{2}{3}\pi \text{ with } x > 0,\ y > 0,\ z > 0$$

THREE DIMENSIONS, TWO CONSTRAINTS

■ 1. Use Lagrange multipliers to find the shortest distance from the vertex of the elliptic paraboloid $(x-2)^2+2(y+1)^2=3z+6$ to the line that's the intersection of the planes $x+3y+5z=18$ and $3x+5y+z=28$.

■ 2. Use Lagrange multipliers to find the local extrema of the function, subject to the given constraints.

$$f(x,y,z)=x^2+2y-3z^2$$

$4x-y=0$ and $y+8z=0$

■ 3. Use Lagrange multipliers to find the local extrema of the function, subject to the given constraints.

$$f(x,y,z)=z$$

$4x+2y+3z=-2$ and $3x^2+y^2-z^2=5$

■ 4. Use Lagrange multipliers to find the local extrema of the function, subject to the given constraints.

$$f(x,y,z)=2\ln x+z$$

$2x + y + z = 4$ and $y^2 + z^2 = 2$

■ 5. Use Lagrange multipliers to find the local extrema of the function, subject to the given constraints.

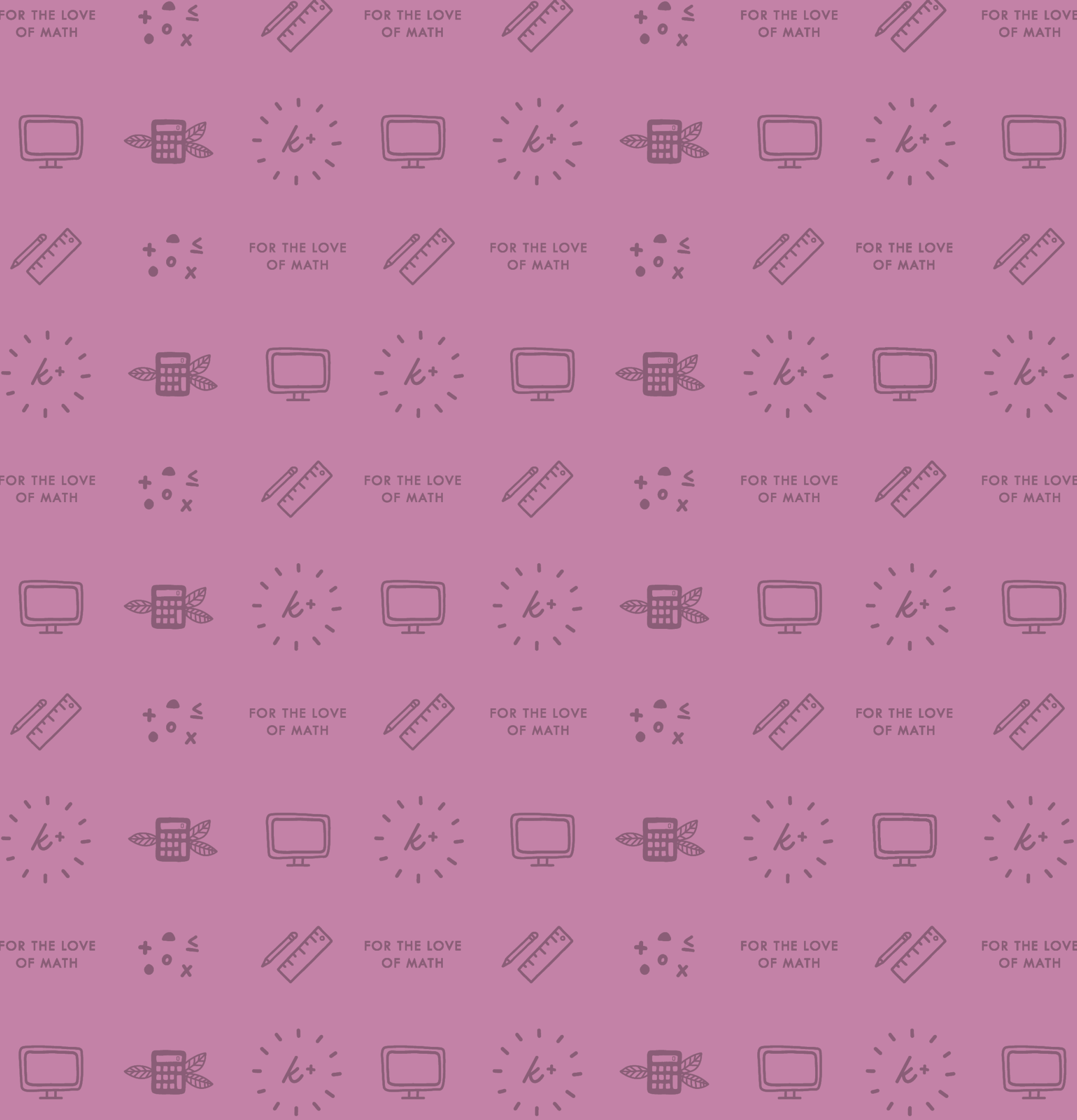
$$f(x, y, z) = 2 \ln x - \ln y^4 + z^2 + 5$$

$2x + 3z^2 = 12$ and $4y + z^2 = 4$

■ 6. Use Lagrange multipliers to find the local extrema of the function, subject to the given constraints.

$$f(x, y, z) = 4x^3 + 2y^3 - 4z + 1$$

$3y^2 - 4z = 12$ and $6x^2 + 4z = 15$



WWW.KRISTAKINGMATH.COM