exercise 1:
Use Lagrange multipliers to find the distance from the point $(0, 1)$ to the parabola with equation $x^2 = 4y$. In other words, find the point on this parabola closest to $(0, 1)$.

Textbook problems
https://openstax.org/books/calculus-volume-3/pages/5-1-double-integrals-over-rectangular-regions
exercise 2: 14, 16, 20
exercise 3: 40

Textbook problems
https://openstax.org/books/calculus-volume-3/pages/5-2-double-integrals-over-general-regions
exercise 4: 74, 77
exercise 5: 94 (the average value of $f$ over R is $\int\int_R f / \int\int_R 1$).

Textbook problems
https://openstax.org/books/calculus-volume-3/pages/5-2-double-integrals-over-general-regions
exercise 6: 86
exercise 7: 98, 99

Textbook problems
https://openstax.org/books/calculus-volume-3/pages/5-3-double-integrals-in-polar-coordinates
exercise 8: 134, 136

Textbook problems
https://openstax.org/books/calculus-volume-3/pages/5-2-double-integrals-over-general-regions
https://openstax.org/books/calculus-volume-3/pages/5-3-double-integrals-in-polar-coordinates
exercise 9: 112. Hint: the first octant is defined by $x \geq 0, y \geq 0, z \geq 0$. Sketch the base of the solids in the $x, y$ plane.
exercise 10: 154, 158
exercise 11: 160
exercise 12: 162
exercise 13: 178