During the course, the HW assignment may be slightly changed. Please, watch the current assignment.

In problems marked by *, the student may skip final calculations, stopping at the moment when the calculations remained are obvious.

1. 9.1: 1, 5, 7a, 8ad, 13, 21-32 (you do not have to (though may) specify regions: just say a plane, or a sphere, or a ball, etc.), 33.
   9.2: 1, 5b, 15-16, 19, 22, 26 (Advice: First, find the coordinates of the vectors, then add them following the addition-of-coordinates rule. The result is the vector of the resulting force), 29, 38, 43 (Hint: Denote by a and b the vectors representing two sides of the triangular, and realize the a — b represents the third side).
   9.3: 1, 2*, 3, 7, 9, 13, 15, 17, 21 (keep in mind that you do not need to know the precise value of the dot product (why?); try to do the first two in mind), 22a, 24, 25, 29, 37 (Advice: First, find the “displacement” vector, and then consider a dot product), 43 (Hint: It suffices to consider a unit cube. Suppose that one vertex of the cube is the point (0, 0, 0) and all others have non-negative coordinates), 50a, 50b (optional), 51a, 51b (optional), 52 (Hint: Just multiply u + v and u — v in the sense of dot product and look at the result of the multiplication).
   A1. Which of these two pairs of vectors are orthogonal?
      (a) (3, 2, 1), (1, 2, —5).
      (b) (3, 2, 1), (1, 2, —7).
   A2. Which of these two pairs of lines are orthogonal? (Hint: You may solve it in mind.)
      (a) 2x + 3y = 5, 3x — 2y = 7.
      (b) 5x + 2y = 5, 3x — 2y = 7.
   9.4: 1, 2, 4, 8, 9, 13, 19, 21, 27, 29*, 31, 35 (Hint: Think about what a × a equals).
   Due to August.

2. 9.5: 1, 2, 7, 8, 11, 14a, 14b*, 17, 21, 23, 24, 31, 39, 55, 57, 59.
   10.1: 1, 4, 5-11 (You may be very “sketchy”; just realize which type of curves you are dealing with; a detailed specification is optional), 12 (a bit challenging: realize that the projections on the coordinate planes in this case are a segment, a circle, and again a circle. What does it mean that a projection is just a part of a line?), 13, 19 (a famous example, the graph is II), 20-24 (the answers are VI, V, I, IV, III; just realize that this is true), 25, 27, 28.
   10.2: 1d, 3, 5*, 6, 7, 8* (Hint: Write representation for x — 1 and y — 2), 9, 11, 13, 14, 17, 25*, 26 (Hint: If a vector is a parallel to a plane, then to what is it perpendicular?), 27.
   Due to August.
3. **11.1**: 3, 5, 7, 12, 13, 15, 17 (optional), 18, 19, 21, 22, 23, 41-43 (You may be sketchy; just words will be enough).

**11.3**: 5, 7 (*Hint*: What does the sign of a second derivative tell us about?), 15, 20, 23, 27, 45, 51, 57, 58.

**11.4**: 1, 2 (Say also which surface we are considering), 3 (Specify also the domain of the function under consideration), 4, 5.

**11.5** 1, 2, 3, 5, 7, 13, 21, 23 (optional, for more training).

**11.6**: 2*, 4*, 5 (To save your time: \(\sin(2\pi/3) = \sqrt{3}/2, \cos(2\pi/3) = -1/2\)), 7, 9, 11 (*Hint*: The vector \(v\) is not a unit vector), 15*, 16, 21, 23, 25, 27, 39.

*Due to August.*

4. **11.7**: 1, 3, 5, 7, 10, 11, 13, 17 (Also sketch a graph. *Hint*: Make notice that \(f(x, y) = (x - 2y)^2 + 2\) (say why)), 27*, 29.

**11.8**: 1, 3, 5, 7 (Also sketch a picture. *Hint*: What are level surfaces of \(f(x, y, z)\)? What surface does the constrain \((x^2 + y^2 + z^2 = 35)\) represent?), 11, 19 (*Hint*: To maximize or minimize \(f(x, y)\) given, isn’t it enough to maximize or minimize just \(xy\) ?), 27, 29 (When doing the last two problem, you may appreciate how the Lagrange multipliers method simplifies solutions).

*Due to.*

5. **12.1**: 11, 13, 14 (just give a sketch).

**12.2**: 3, 7, 9, 15*, 17*, 20, 21, 25*, 27 (*Hint*: What is the projection of the surface under consideration on the \(xy\)-plane? Sketch this projection together with the rectangle of integration \(R\).)

*Due to.*