Due Tue March 1

1. Find max and min values of the function f(x, y) along the given curve. Plot the curve and the level curves of the function in the vicinity of the points where the function achieves max or min values.

(a)
$$f(x,y) = 4x + 6y$$
, curve: $x^2 + y^2 = 13$.

(b)
$$f(x,y) = x^2 - y^2$$
, curve: $x^2 + y^2 = 1$.

- 2. Evaluate the integral and sketch the domain of integration.
 - (a) $\int_{1}^{2} \int_{y}^{2} xy \, dx \, dy$.
 - (b) $\int_0^1 \int_0^x \sqrt{1-x^2} \, dy \, dx.$
 - (c) $\int \int_D x \cos y \, dA$, where region D is bounded by $y = 0, y = x^2, x = 1$.
 - (d) $\int \int_D e^{x/y} dA$, where region D is bounded by $1 \le y \le 2, y \le x \le y^3$.
 - (e) $\int_0^1 \int_{3y}^3 e^{x^2} dx dy$. Hint: reverse the order.
 - (f) $\int_0^1 \int_{\sqrt{y}}^1 \sqrt{x^3 + 1} \, dx \, dy.$
 - (g) $\int \int_D \cos(x^2 + y^2) dA$, where region D is above the x-axis and within $y^2 + x^2 = 9$.
 - (h) $\int \int_D e^{-x^2 y^2} dA$, where region D is bounded by y-axis and $x = \sqrt{4 y^2}$.
- 3. Find the area of the surface:
 - (a) the part of the surface $z = 1 + 3x + 2y^2$ that lies above the triangle with vertices (0,0), (0,1), (2,1).
 - (b) the part of the elliptic paraboloid $z = 4 x^2 y^2$ that lies above the xy-plane.
 - (c) the part of the hyperbolic paraboloid $z = y^2 x^2$ that lies between cylinders $x^2 + y^2 = 1$ and $x^2 + y^2 = 4$.
 - (d) the part of the sphere of radius 4 and center at the origin, that lies above the plane z = 1.

4. Evaluate

- (a) $\int_0^1 \int_0^z \int_0^y z e^{-y^2} dx dy dz$.
- (b) $\int \int \int_E y dV$, where E is bounded by planes x = 0, y = 0, z = 0 and 2x + 2y + z = 4.
- (c) $\int \int \int_F z dV$, where F is bounded by the cylinder $y^2 + z^2 = 9$ and the planes x = 0, y = 3x, z = 0 in the first octant.