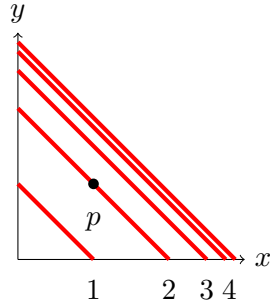


Print Your Name Legibly: _____

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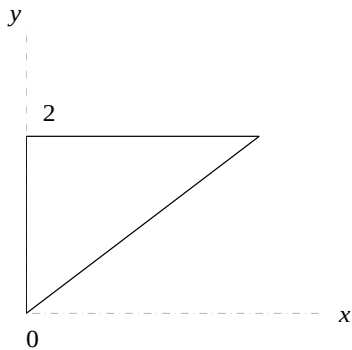
Instructions: You must show supporting work to receive full and partial credits. No textbook, notes, cheat sheets, calculators allowed.

- 1(10pts)** A contour diagram is given for a function $z = f(x, y)$ with level curves $z = 1, 2, 3, \dots$, as shown. Determine the sign of f_{xx} at point p . (Show work or give explanation for credit.)



- 2(10pts)** For function $z = f(x, y) = e^{xy}$, find the Taylor polynomial of degree 2 for $f(x, y)$ near $(a, b) = (1, 0)$.

- 3(15pts)** The region R is bounded by the y -axis, the line $y = x$, and $y = 2$. Set up an iterated integral in the polar coordinate for the integral $\iint_R y dA$. Do not evaluate the integral.

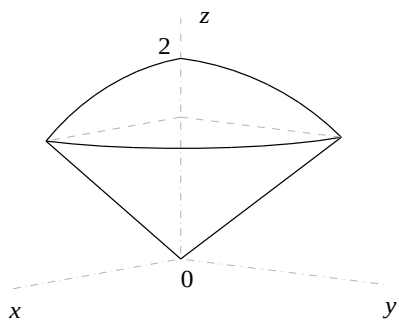


4(15pts) (a) Sketch the region of the integral $\int_0^2 \int_0^{y^2} \delta(x, y) dx dy$.

(b) Change the order of the iterated integral to $dy dx$.

5(20pts) Let G be the solid which is in the first octant, bounded by the sphere $x^2 + y^2 + z^2 = 4$ and the cone $z = \sqrt{x^2 + y^2}$. Let $\delta(x, y, z) = y$ be the density function.

(a) Set up an iterated integral in the order of $dz dy dx$ for the mass of the solid. Do not evaluate the integral.



(b) Set up an iterated integral in the spherical coordinate for the mass of the solid. Do not evaluate the integral.

6(15pts) Let $f(x, y) = x^2/2 + 3y^3 - 9y^2 - 3x$.

(a) Find all critical points of the function.

(b) Classify all critical points.

7(15pts) Use the Lagrange multiplier method to find the constraint local minimum and local maximum of $f(x, y) = x^2y$ subject to $2x + y = 6$.