Lagrange Multipliers and Integration

Name: ____________

Math 1920 - Sections 221 and 222 - TA: Itamar Oliveira

October 16, 2018

Problems

(1) Find the point in the first quadrant on the curve $y = x + x^{-1}$ closest to the origin.

(2) Use Lagrange Multipliers to find the dimensions (i.e. radius and height) of a cylindrical can with a bottom but not top, of fixed volume V with minimum surface area.

(3) Evaluate the following integrals using Fubini's theorem.

(a) $\displaystyle\int_0^1 \int_0^1 y\sqrt{1+xy}\, dy\, dx.$

(b) $\displaystyle\int_0^1 \int_0^1 xe^{xy} dx\, dy.$

(4) Compute the double integral over the domain $\mathcal{D}$ indicated

(a) $f(x,y) = x$; $0 \le x \le 1$, $1 \le y \le e^{x^2}$.

(b) $f(x,y) = \sin x$; bounded by $x = 0$, $x = 1$, $y = \cos x$.

(5) Find the volume of the region bounded by $z = 40 - 10y$, $z = 0$, $y = 0$, and $y = 4 - x^2$.

(6) Find the average height of the "ceiling" in Figure 2 defined by $z = y^2 \sin x$ for $0 \le x \le \pi$, $0 \le y \le 1$.

(7) Find the triple integral of the function z over the ramp in the picture below. Here, z is the height above the ground.

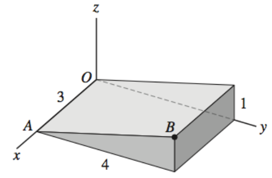

Figure 1: Problem 7

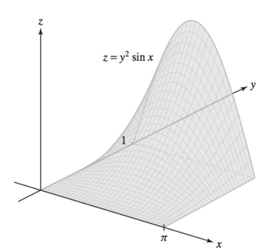

FIGURE 30

Figure 2: Problem 6