§13.1 & 13.2 # WrittenHW #7 TMath 126

1. Let $f(x,y) = \int_x^y \frac{1}{t}\,dt$. Show your work for each of the following:
   (a) [2] If possible find $f(e^2, e)$.
   (b) [1] If possible find $f(-1, 1)$.
   (c) [2] Find the domain of f.

2. The length of time that one waits in line, on average is $W(x,y) = \frac{1}{x-y}$, where y is the average arrival rate (with units of customers per unit of time) and x is the average service rate (with units of customers per unit of time).
   (a) [2] Find the domain of W.
   (b) [2] Evaluate $W(12, 7)$ and explain its meaning.
   (c) [2]Find $\lim_{(x,y)\to(1,0)} W(x,y)$ and explain its meaning.

3. [4] Create a function $f(x,y)$ with the following properties:
   (a) continuous at $(0,0)$
   (b) $\lim_{(x,y)\to(3,0)} f(x,y) = \infty$
   (c) $f(3,0) = -1$

13.3 & 13.6 # WrittenHW #7 TMath 126

1. Let $f(x, y) = y^2 \log_2(x)$

   (a) [2] Find ∇f.

   (b) [4] Find f_{xx}, $\frac{\partial}{\partial y}(\frac{\partial f}{\partial x})$, z_{yx}, and $\frac{\partial^2 f}{\partial y^2}$

   (c) [4] Find the derivative of f in the direction $\overrightarrow{PQ}$ where $P(1, 2)$ and $Q(4, 3)$.

2. A company makes a freestanding wood-burning stove and a fireplace-insert model. The cost function for producing x freestanding and y fireplace-insert stoves is

$$C = 32\sqrt{xy} + 175x + 205y + 1050.$$

   (a) [3] Find the marginal costs with respect to x and with respect to y when $x = 80$ and $y = 20$.

   (b) [2] When additional production is needed, which model of stove would be more cost effective to produce (i.e. keep costs lower)? Explain your reasoning.