Calc 3 - HW

Note Title 10/19/2011

(1) Continuous functions of one variable can not have two local max without having a local min. draw a sample graph For two-variable functions this is different: Show that

$$f(x,y) = -(x^2-1)^2 - (x^2y - x - 1)^2$$

has only 2 critical points, both of which are max. Use Maple to visualize the function.

(2) Find the point on the plane $x - y + z = 4$ closest to $(1,2,3)$.

(3) Find three positive numbers whose sum is 100 and whose product is max.

(4) Find the rectangular box with largest volume and total surface area of $64\,cm^2$.

(5) Find the absolute max and min for

a) $f(x,y) = x^2 + y^2 + x^2y + 4$ in $[-1,1] \times [-1,1]$

b) $f(x,y) = 3 + xy - x - 2y$ in the triangular region with vertices $(1,0)$, $(5,0)$, and $(1,4)$

6. Estimate the volume below $z=xy$ and above the rectangle $D=[0,6]\times[0,4]$ by dividing the x-interval into 4 points, the y-interval into 3 points, and taking as height the value of $f(x,y)$ at each upper-right corner. Compare your answer with

$$\iint_D xy \, dA$$

7. Use Fubini's Theorem to compute:

a) $\displaystyle\int_0^3\int_0^1 1+4xy \, dx\, dy$

b) $\displaystyle\int_0^1\int_1^2 4x^3-9x^2y^2 \, dy\, dx$

c) $\displaystyle\int_0^1\int_0^1 xy\sqrt{x^2+y^2} \, dy\, dx$

d) $\displaystyle\int_0^1\int_0^1 \sqrt{s+t} \, ds\, dt$

e) $\displaystyle\iint_R \frac{1+x^2}{1+y^2} \, dA$, $R=[0,1]\times[0,1]$

f) $\displaystyle\iint_R \frac{x}{x^2+y^2} \, dA$, $R=[1,2]\times[0,1]$