Ord: ___ ___

Calc III
MAC2313 3191

Y-class

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Please. Do ***not*** approx.: If your result is "$\sin(\sqrt{\pi})$" then write that rather than .9797···.Use "$f(x)$ notation" when writing fncs; in particular, for trig and log fncs. E.g, write "$\sin(x)$" rather than the horrible $\sin x$ or $[\sin x]$.Write expressions unambiguously e.g, "$1/a+b$" should be bracketed either $[1/a]+b$ or $1/[a+b]$. (Be careful with **negative** signs!)

Y4: Show no work.

___ ___ z Prof. King believes that writing in complete sentences aids in communicating technical ideas. Circle *one:* **True** ***What's a sentence?*** **DNE**

___ ___ a+ Let $P_0 := (2\pi, 1, 2)$. Compute the gradient of $h(x, y, z) := xy + z \cdot \sin(x)$.

$[\nabla h](P_0)$= ....

Give an example of a *polynomial* f which has a saddle-point at $(-8, 7)$.

$f(x, y) :=$ ....

___ ___ b+ In $\mathbb{R}^3$, let S be the surface

$$6x - 3x^2 + 3 \quad = \quad 2y^2 + z^2\,.$$

Vector $\mathbf{v}$= .... $\neq \mathbf{0}$ is $\perp$S at $Q := (0, 1, 1)$.

In form $A[x - x_0] + B[y - y_0] + C[z - z_0] = 0$, write an *equat*ion for the tangent plane to S at Q.

Eqn:

....

Have arranged that A, B, C are **integers** with no common factor; also, that $A \geqslant 0$.

___ ___ c+ Let $f(x, y) := x + 8y$. *Subject to the constraint that* $y^2 = x$, compute the location (x_0, y_0) of a **global maximum** of f, and compute the location (x_1, y_1) of a **global minimum** of f.

Max=(....... , ...); Min=(....... , ...).

___ ___ d An object in the first octant occupies the cube $[0, L] \times [0, L] \times [0, L]$ The mass-density at each point in the cube is equal to the square of the point's distance from the origin, so the **total mass** of the object is ....

Y5: A box [rectangular parallelepiped] lies in the first octant, with three faces on the coordinate-planes and one vertex, agree to call it P, on the plane $2x + y + 4z = 12$. Use Lagrange Multipliers to compute the (unique) value of P which *maximizes* the *volume* of the box.

First, draw a large clear picture of the octant and the plane. Compute and label the x, y, z-intercepts of the plane, so that your picture is accurate. Now compute the four Lagrange equations: [The first eqn. is the constraint eqn.]

C_f **:**

L_x **:**

L_y **:**

L_z **:**

Now solve the system to compute [fill in the three blanks] $P = ($ .... , ... , ... $)$.

End of Y-class

Y-home:	___ ___ ___	460pts
Y4:	___ ___ ___	180pts
Y5:	___ ___	50pts
Total:	___ ___ ___	690pts

HONOR CODE: *"I have neither requested nor received help on this exam other than from my professor (or his colleague)."*
Name/Signature/Ord

Ord:
....