

Ord: _____

Calc 3
MAC2313

Class-W

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Hello. All is short answer. Show no work.

W1: Please write **DNE** in a blank if the described object does not exist or if the indicated operation cannot be performed.

a Give an example of a *polynomial* f which has a saddle-point at $P := (7, -3)$.

$f(x, y) :=$ _____

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

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

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

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

Eqn:

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

c Determinant of $M := \begin{bmatrix} 2 & 0 & 1 \\ 0 & -1 & 3 \\ 0 & 2 & 0 \end{bmatrix}$ is _____

The characteristic-poly of M is $Ax^3 + Bx^2 + Cx + D$, where $B =$ _____ and $C =$ _____

d Astronomers discover a new planet! Its circular-orbit around our sun has radius 4AU (4 times Earth's orbital-radius). So its "year" is _____ Earth-years.

e Let $P_0 := (1, 3, 2\pi)$. Compute the gradient of $h(x, y, z) := x^2yz + y^3 \cdot \sin(z)$.
 $[\nabla h](P_0) =$ _____

W2: A cylindrical soup-can has radius r and height y ; so its volume is $\pi \cdot r^2 \cdot y$. Per square-inch, the metal of the top and the bottom cost thrice as much as the metal of the side. Thus its cost function is

$f(r, y) =$ _____

Subject to the volume being held constant (say, 10 cubic inches), what is the *ratio* of y/r that minimizes the cost of the can? Use Lagrange multipliers. Let g denote the specifier fnc that you choose. Compute the three Lagrange equations: [The first eqn. is the constraint eqn.]

$C_g :$ _____ = _____

$L_r :$ _____ = _____

$L_y :$ _____ = _____

Solve the system to compute $\frac{y}{r} =$ _____

End of Class-W

W1: _____ 155pts

W2: _____ 85pts

Total: _____ 240pts

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

Ord:
