MATH 21C

SEC. 14.7 - 14.8 — EXTRA PROBLEMS

FOR THE FOLLOWING FUNCTIONS,

A) FIND ALL OF THE CRITICAL POINTS,

B) CLASSIFY EACH CRITICAL POINT AS CORRESPONDING TO A LOCAL MAXIMUM, LOCAL MINIMUM, OR SADDLE POINT.

1. $f(x,y) = x^2 + 2xy + 7y^2 - x^2y - 2xy^2 - 2y^3$

2. $f(x,y) = 4x^2e^y - 2x^4 - e^{4y}$

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3. FIND THE DIMENSIONS OF THE RECTANGULAR BOX WITH AN OPEN TOP AND A VOLUME OF $32\ \text{CM}^3$ WHICH HAS MINIMAL SURFACE AREA.

4. A CLOSED RECTANGULAR BOX WITH A VOLUME OF $60\ \text{FT}^3$ IS TO BE MADE OF MATERIAL WHICH COSTS \$2/FT^2 FOR THE BOTTOM, \$1/FT^2 FOR THE TOP, AND ONLY \$.20/FT^2 FOR THE SIDES. FIND THE DIMENSIONS OF THE LEAST EXPENSIVE SUCH BOX.

5. FIND THE MAXIMUM AND MINIMUM VALUES OF $f(x,y) = x^2 - y^2 + 2xy$ ON THE CLOSED DISC BOUNDED BY THE CIRCLE $x^2 + y^2 = 9$.

6. FIND THE POINT ON THE PLANE $3x + 2y - z = -17$ WHICH IS CLOSEST TO THE POINT $P(5, 2, 8)$ USING THE IDEAS IN

   A) SEC. 12.5 B) SEC. 14.7 C) SEC. 14.8

USE LAGRANGE MULTIPLIERS TO FIND THE FOLLOWING:

7. THE MAX. VALUE OF $f(x,y) = 2x - y$ ON THE ELLIPSE $4x^2 + y^2 = 72$.

8. THE MAX. AND MIN. VALUES OF $f(x,y) = xy$ ON THE ELLIPSE $x^2 + 4y^2 = 8$.

9. THE MAX. VALUE OF $f(x,y) = xy$ ON THE ELLIPSE $3x^2 + 4x + 4y^2 = 0$.

10. THE MAX. AND MIN. VALUES OF $f(x,y,z) = 2x - 3y + z$ ON THE ELLIPSOID $(x-5)^2 + 3y^2 + 2(z+4)^2 = 30$.

11. THE DIMENSIONS OF THE RECTANGULAR BOX WITH AN OPEN TOP AND A SURFACE AREA OF $48\ \text{FT}^2$ WHICH HAS MAXIMUM VOLUME.

12. THE MAX. AND MIN. VALUE OF $f(x,y,z) = 4x + 3y + 4z$ ON THE INTERSECTION OF THE PLANE $x + y + 2z = 8$ AND THE CYLINDER $x^2 + y^2 = 20$.
