' 'xam 2

Friday, . ':35pm 2022

This exam has 4 problems. Show all your work 'ur answers. Answers with missing or insufficient justification will receive no points. You are allow n page of notes (ONE side). You may NOT use a calculator, smartphone, smartwatch, the Internet c 'ronic device.

Problem 1 (30 pts)
Consider the function

$$f$$

(a) Graph the level curve of $f(x;y)$ that passes ıt $(0;2)$. Label the value of f along the curve.
(b) On the same graph as part (a) graph the le' $f(x;y) = 1$. Label the value of f along this curve.
(c) On the same graph as part (a), graph one le : $f(x;y) < 0$. Label the value of f along this curve.
(d) At the point $(1;1)$, give a vector that point n in the domain where this function *decreases* fastest.
(e) Sketch the vector you found in part (d) star your graph from part (a).
(f) Use a *2nd order (i.e. quadratic)* Taylor ap tered at $(1;1)$ to approximate $\frac{\sqrt{1{:}8}}{1{:}5}$
You can leave your answer as an unsim or difference of terms.

Problem 2 (22 pts) The temperature (in degrees egion in space is given by

$$T(\ldots \quad \frac{1}{2}xyz$$

A particle is moving in this region and its pos' given by

$$\vec{r}(t) \quad e^{(9-t}$$

Problem 4 (20 pts)

A mother puts her child on an amusement park ride that takes the child along a path in the xy-plane described by the equation $x^2 - 2x = 4y - y^2$. While the child is on the ride, the mother stands at the location $(x; y) = (0; 0)$.

(a) Use Lagrange multipliers to find the minimum and maximum distances from the mother to the child during the ride.

(b) Give the $(x; y)$ coordinates of the child at the minimum and maximum distances.

End Of Exam
