

ANGENENT

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MATH 234

1st midterm

Monday, *February 21*, MMV

Your Name:

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Score — 1: % 2: % 3: % 4: % Total: %

1 [25%] Given a function $z = f(x, y)$ we consider the function

$$g(t) = f(t^2, 4t^4 + t^3 - t).$$

It is known that $f_x(1, 4) = A$, and $f_y(1, 4) = B$.

Compute $g'(-1)$ and $g'(1)$. (The constants A and B may appear in your answer.)

- 2 (i) [20%] Find the equation for the tangent plane to the graph of $z = f(x, y)$, where

$$f(x, y) = \ln(1 + x^2 + y^2)$$

at the point $(x_0, y_0) = (1, 3)$.

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- (ii) [5%] Where does the tangent plane intersect the z axis?

- 3 [25%] A function $z = f(x, y)$ satisfies $x^2 + y^4 + xyz + z^4 = C$ for some constant C . Furthermore, one knows $f(1, 1) = 2$. Compute the constant C and compute $\nabla f(1, 1)$.

4 (i) [20%] Find the critical points of the function $f(x,y) = y^2 + xy - x^2y$.

(ii) [5%] What is the largest value $f(x,y) = y^2 + xy - x^2y$ can have if $0 \leq x \leq 1$?
(Explain your answer – hint: at which points (x,y) is $f(x,y) = 0$, and where is $f(x,y) > 0$?)