

Math 14
Winter 2009
Homework Assigned Monday, January 12

For problems (1)-(3), write the function A in the matrix and column vector format.

(1.) Find a function A whose graph is the tangent plane to the graph of $f(x, y) = e^x - xy$ at the point $(x, y) = (1, 2)$.

(2.) Find a function A giving the position function of a moving object that has the same position and velocity at $t = 1$ of an object with position function $\vec{r}(t) = \langle t, 1 - t^2, 2t \rangle$.

(3.)

(a.) Find the tangent approximation A to the function $F(u, v) = \langle \cos u, \sin u, v \rangle$ at the point $(u, v) = (\pi, 1)$.

(b.) What is the range of F ? (Hint: Consider first the x and y components of $F(u, v)$, namely $(\cos u, \sin u)$.)

(c.) What is the range of A ?

(d.) How are the ranges of F and A related?

(4.) Show, using the limit definition of tangent (but NOT using epsilons and deltas) that the graphs of $f(x, y) = x^2 + y^2$ and

$$A(x, y) = \begin{pmatrix} 4 & 6 \end{pmatrix} \begin{pmatrix} x - 2 \\ y - 3 \end{pmatrix} + 13$$

are tangent at the point $(x, y) = (2, 3)$.