

1. Find the matrix of the linear map that gives the derivative of the following functions at the indicated base points and use this linear map to approximate the value of the function at the nearby points indicated.

Table 1: default

function	base point	nearby point
$f(x, y) = 3xy + 17x^2$	(1, 2)	(2, 1)
$\gamma(t) = (t^3, \sin(\pi t))$	2	3
$g(x, y) = (\sqrt{x^2 + y^2}, \arctan(y/x))$	(1, 1)	(1, 0)
$h(x) = x^2$	2	3