Calculus 3, Exam 2 Formulas

December 2, 2018

Gradients, Directional Derivatives

Chain Rule (Alternate Method and Multivariate Method):

Given $y = f(x)$, $x = g(t)$, then

$$y = f(x) = f(\ g(t)\ )$$

and

$$\frac{dy}{dt} = \frac{dy}{dx}\frac{dx}{dt}$$

The following is then true:

Given $z = f(x, y)$, where $x = g(t)$, $y = h(t)$,

$$z = f(x, y) = f(\ g(t), h(t)\ )$$

and

$$\frac{dz}{dt} = \frac{\partial f}{\partial x}\frac{dx}{dt} + \frac{\partial f}{\partial y}\frac{dy}{dt}$$

The Gradient:

Given $f(x, y)$, the gradient of f is

$$\nabla f = \left(\frac{\partial f}{\partial x}, \frac{\partial f}{\partial y}\right)$$