



Quiz # 7
Math 102-011 Calculus
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YOUR NAME:

In this quiz you can use fingers, calculators or smart phones to do your calculations.

However show your work in detail. Correct answer without proper explanation does not receive any partial credits.

Q-1) Consider the differentiable functions

$$z = f(x, y), \quad \text{where } x = g(s, t) \quad \text{and} \quad y = h(s, t).$$

Now consider the following data:

$f(0, 0) = 19$	$f(3, 5) = 14$	$f_x(0, 0) = 23$	$f_x(3, 5) = 16$	$f_y(0, 0) = 29$	$f_y(3, 5) = 18$
$g(0, 0) = 3$	$g(3, 5) = 2$	$g_s(0, 0) = 7$	$g_s(3, 5) = 6$	$g_t(0, 0) = 11$	$g_t(3, 5) = 8$
$h(0, 0) = 5$	$h(3, 5) = 4$	$h_s(0, 0) = 13$	$h_s(3, 5) = 10$	$h_t(0, 0) = 17$	$h_t(3, 5) = 12$

(i) Calculate $\frac{\partial z}{\partial s}(0, 0)$. **(ii)** Calculate $\frac{\partial z}{\partial t}(0, 0)$. **(iii)** Calculate $D_{\vec{u}}f(0, 0)$, where $\vec{u} = (\frac{3}{5}, \frac{4}{5})$.

: Grading is 35+35+30 points.

Answer:

(i)

$$\begin{aligned} \frac{\partial z}{\partial s}(0, 0) &= f_x(3, 5)g_s(0, 0) + f_y(3, 5)h_s(0, 0) \\ &= 16 \cdot 7 + 18 \cdot 13 \\ &= 346. \end{aligned}$$

(ii)

$$\begin{aligned} \frac{\partial z}{\partial t}(0, 0) &= f_x(3, 5)g_t(0, 0) + f_y(3, 5)h_t(0, 0) \\ &= 16 \cdot 11 + 18 \cdot 17 \\ &= 482. \end{aligned}$$

(iii)

$$\begin{aligned} D_{\vec{u}}f(0, 0) &= f_x(0, 0) \cdot \frac{3}{5} + f_y(0, 0) \cdot \frac{4}{5} \\ &= 23 \cdot \frac{3}{5} + 29 \cdot \frac{4}{5} \\ &= 37. \end{aligned}$$