

MATH 2401, PRACTICE TEST 1

Let Q be the square $-\pi \leq x \leq \pi$, $-\pi \leq y \leq \pi$,

$$f(x, y) = \cos x + \cos y$$

and $\mathbf{r}(t) = \pi t \mathbf{i} + \pi t^2 \mathbf{j}$.

- 1) Is Q an open or a closed set? Is it connected? Is it bounded?
- 2) Compute the differential of $f(x, y)$
- 3) Compute the differential of $f(x, y)$ along the direction of $\mathbf{r}(t)$.
- 4) Find the absolute maximum and the absolute minimum of $f(x, y)$ on Q .
- 6) Find the tangent plane to the surface $z = f(x, y)$ in the points $(0, 0)$ and $(1, -1)$.
- 7) Let $\mathbf{a} = \mathbf{i} + \mathbf{j}$ and $\mathbf{b} = \mathbf{i} - \mathbf{j}$. Find a point \mathbf{c} such that $\nabla f(\mathbf{c}) \cdot (\mathbf{b} - \mathbf{a}) = f(\mathbf{b}) - f(\mathbf{a})$.
- 8) Find the absolute maximum and the absolute minimum of $f(x, y)$ on the portion of $\mathbf{r}(t)$ contained in Q .
- 9) Find the absolute maximum and the absolute minimum of $g(x, y) = (\cos x + \cos y)^2$ on Q .