

# H.W # 3

1) Sketch the curve of  $r(t) = \langle \cos t, \sin t, 1 \rangle$ . Also identify the curve and indicate the direction of increasing parameter.

2) Let  $r(t) = \langle z \cos t, z \sin t, 1 \rangle$ . Find  $\kappa(t)$  of  $C$ . Describe the curve  $C$ .

3) Let  $r(t) = \langle z+t, 3-t, zt+1 \rangle$ . Find  $\kappa(t)$  of  $C$ . Describe the curve  $C$ .

4) Find  $\lim_{(x,y,z) \rightarrow (0,0,0)} \frac{xyz}{x^4 + 2y^4 + z^2}$  if it exists (verify!).

5) Let  $f(x,y) = \begin{cases} \frac{x^2 + y^2}{x^2 - y^2} & (x,y) \neq (0,0) \\ k & (x,y) = (0,0) \end{cases}$

Find  $k$  so that  $f$  is continuous (if any).

6) Let  $x^2 - \ln(y-z) = 3y^2$ . Find  $z_y$  &  $z_x$ .

7) Let  $z = f(x^2 + y^2, x^2 - y^2)$ . Find  $z_{xx}$  &  $z_{yy}$ .

8) Find the maximum rate of change of  $f(x,y) = \sin(xy)$  at  $(1,0)$  and the direction in which it occurs.

Find also the minimum rate of change of  $f$  at  $(1,0)$  and the direction in which it occurs.

9) Find the absolute max. value & the absolute min.

value of  $f(x,y) = x + y - xy$  on the closed triangular region  $D$  with vertices  $(2,0)$ ,  $(0,2)$ , and  $(0,-2)$ .