BP's of GE_3 by a formula system of Basilevsky [7]

$$u_{tt}(u_{tt}-u_{gg})+u_g u_{gtt}=0, \qquad (7)$$
$$u_{tg}=0,$$

where g, t denotes direction derivatives in the gradient and the tangential direction on the contour line. In the symmetric model of Eq. (6), if we are interested only in the points of the diagonal GE_3 with $y=-x$, the direction derivatives can be easily obtained by a $\pi/2$ rotation of the (x, y) coordinates in (g, t) "coordinates":

$$x=(t-g)/2^{1/2}, \qquad y=(t+g)/2^{1/2}.$$

We get the representation of the surface equation (6)

$$u(t, g)=g(t^2-g^2-4)/2^{3/2},$$

and the derivatives

$$u_g=(t^2-3g^2-4)/2^{3/2}, \qquad u_t=tg/2^{1/2},$$
$$u_{gg}=-3g/2^{1/2}, \qquad u_{tt}=g/2^{1/2}, \qquad u_{tg}=t/2^{1/2},$$
$$u_{gtt}=1/2^{1/2}.$$

With condition equation (7) we get $t=0$, $5g^2+t^2-4=0$,

Thus,

$$g=\pm\tfrac{2}{5}^{1/2}$$

and by a back-transformation the given BP's in (x, y) coordinates result. They are the triple points ψ and $\pitchfork$ in the Basilevsky classification [8].

What happens in a bifurcation point which is no SP? On GE_3 the gradient takes a maximal value if we test it over a contour line, see Fig. 6a. Thus, v_2 is a cirque throughout and r_2 a cliff [1]. In BP's, a σ-curve over a contour line flattens to a horizontal line, (Fig. 6b). In a local neighbourhood of the BP, every point of the

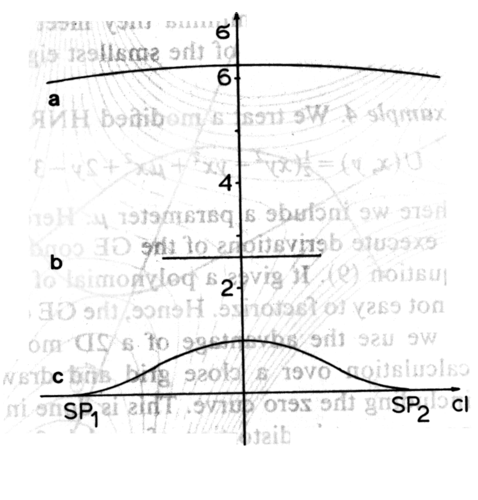

Fig. 6. σ profile over contour lines (cl) of Fig. 4. **a** cl through point $(-1, 1)$; **b** cl through BP_1, **c** cl through point $(0, 0)$