$f(x)\,g(x)$

$f(x)g'(x) + f'(x)g(x)$

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Exercise 1. Classify the critical points of $f(x,y) = xy(x-2)(y+3)$

$f_x = y(y+3)(x-2) + xy(y+3)(1)$ for f_x C: $y = 0, -3$

$f_y = x(x-2)(y+3) + xy(x-2)$ for f_y C: $x = 0, 2$

$0 = (y^2+3y)(x-2) + x(y^2+3y)$ C = $\{(0,0), (0,-3), (2,0), (2,-3), (1,-3/2)\}$

$(y^2+3y)(2x-2) = 0$

$(x-2)(y+3)$

$f_{xx} = (y-2) + y(y+3) + y(y+3)$

$f_{yy} = (x+3) + x(x-2) + x(x-2)$

$f_{xy} = (x-2)(y+3) + y(x-2) + x(y+3) + xy$

$D(x,y) = f_{xx} f_{yy} - (f_{xy})^2$

$f_{xx}(2,0) = 0$, $f_{yy}(0,0) = 0$ $f_{xy}(0,0) = -6 \Rightarrow D(0,0) = -36$ saddle

$f_{xx}(2,0) = 0$, $f_{yy}(2,0) = 0$, $f_{xy}(2,0) = 6 \Rightarrow D(0,0) = -36$ saddle

$f_{xx}(1,-3/2) = -9/2$ $f_{xy}(1,-3/2) = -2$, $f_{xy}(1,-3/2) = 0 \Rightarrow D(1,-3/2) = 9$ loc. Max