

Find all points on the curve

$2(x^2+y^2)^2 = 25(x^2-y^2)$  where the tangent line is horizontal.

Differentiate implicitly:

$$4(x^2+y^2)(2x+2yy') = 25(2x-2yy')$$

$$8x(x^2+y^2) + 8y(x^2+y^2)y' = 50x - 50yy'$$

$$y'(8y(x^2+y^2) + 50y) = 50x - 8x(x^2+y^2)$$

$$y' = \frac{50x - 8x(x^2+y^2)}{8y(x^2+y^2) + 50y}$$

Horizontal tangent occurs when  $y' = 0$ , provided  $y'$  is defined.

$$y' = 0 \Rightarrow 50x - 8x(x^2+y^2) = 0$$

$$2x(25 - 4(x^2+y^2)) = 0$$

$$2x = 0 \Rightarrow x = 0 \text{ (no solution since, when } x=0, y=0 \text{ so } y' \text{ dne)}$$

$$25 - 4(x^2+y^2) = 0 \Rightarrow 25 = 4(x^2+y^2)$$

$$\frac{25}{4} = x^2 + y^2$$

$$y^2 = \frac{25}{4} - x^2$$

plug this back in to solve for  $x$ .