

1. In case of each of the relations given, express y' in terms of x and y .

a) $x^3 + y^3 = 30$

d) $\sqrt{x^2 + y^2} = y^3 - 8$

g) $x^2 - y^2 = \tan y$

b) $x^2 - y^2 = xy$

e) $\ln(x + y) = x^2 + y^2$

h) $\sin x - \cos y = \ln x + \ln y$

c) $x^4 + y^4 = x^2 y^2$

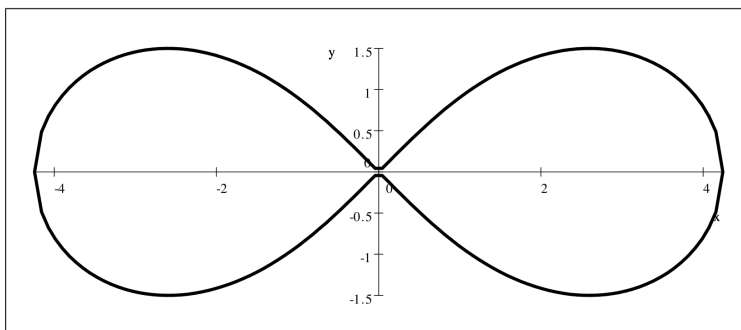
f) $x^2 - y^2 = \tan x$

i) $e^{\sin x} = \frac{x}{y}$

2. Find the equation of the tangent line drawn to the graph of $3x^2 + 4x + 2y^2 - 31y + 16xy + 157 = 0$ at the point $(-1, 4)$.

3. Consider the relation determined by the equation $6y + xy(y - x - 5) = 6x + 30$. Find an equation for all tangent line(s) drawn to the graph of the relation at $x = 2$.

4. Bernoulli's Lemniscate, shown on the picture below is determined by the equation $(x^2 + y^2)^2 = 18(x^2 - y^2)$. Compute the equation of the tangent line drawn to the lemniscate at the point $(2, \sqrt{2})$.



Answers

1. a) $y' = -\frac{x^2}{y^2}$ b) $y' = \frac{-2x + y}{-x - 2y}$ c) $\frac{-2x^3 + xy^2}{2y^3 - x^2y}$ d) $y' = \frac{1 - 2x^2 - 2xy}{2xy + 2y^2 - 1}$ e)
- $y' = \frac{x}{3y^2\sqrt{x^2 + y^2} - y}$ f) $y' = \frac{2x - \sec^2 x}{2y}$ g) $\frac{2x}{2y + \sec^2 y}$ h) $y' = \frac{-xy \cos x + y}{xy \sin y - x}$ i)
- $y' = \frac{y}{x} - \frac{y^2}{x} (\cos x) e^{\sin x}$
2. $y = 2x + 6$
3. $y = x + 5$ and $y = \frac{3}{2}x - 6$
4. $\frac{\sqrt{2}}{5}(x - 2) = y - \sqrt{2}$