3.8 EXERCISES

For the following exercises, use implicit differentiation to find $\frac{dy}{dx}$.

300. $x^2 - y^2 = 4$

301. $6x^2 + 3y^2 = 12$

302. $x^2 y = y - 7$

303. $3x^3 + 9xy^2 = 5x^3$

304. $xy - \cos(xy) = 1$

305. $y\sqrt{x+4} = xy + 8$

306. $-xy - 2 = \frac{x}{7}$

307. $y\sin(xy) = y^2 + 2$

308. $(xy)^2 + 3x = y^2$

309. $x^3 y + xy^3 = -8$

For the following exercises, find the equation of the tangent line to the graph of the given equation at the indicated point. Use a calculator or computer software to graph the function and the tangent line.

310. **[T]** $x^4 y - xy^3 = -2$, $(-1, -1)$
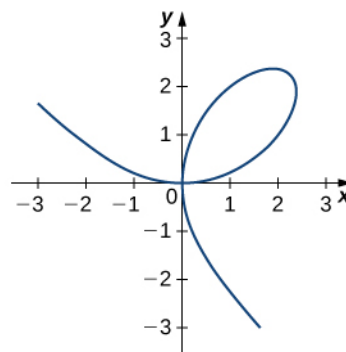
311. **[T]** $x^2 y^2 + 5xy = 14$, $(2, 1)$

312. **[T]** $\tan(xy) = y$, $\left(\frac{\pi}{4}, 1\right)$

313. **[T]** $xy^2 + \sin(\pi y) - 2x^2 = 10$, $(2, -3)$

314. **[T]** $\frac{x}{y} + 5x - 7 = -\frac{3}{4}y$, $(1, 2)$

315. **[T]** $xy + \sin(x) = 1$, $\left(\frac{\pi}{2}, 0\right)$

316. **[T]** The graph of a folium of Descartes with equation $2x^3 + 2y^3 - 9xy = 0$ is given in the following graph.

a. Find the equation of the tangent line at the point $(2, 1)$. Graph the tangent line along with the folium.

b. Find the equation of the normal line to the tangent line in a. at the point $(2, 1)$.

317. For the equation $x^2 + 2xy - 3y^2 = 0$,

a. Find the equation of the normal to the tangent line at the point $(1, 1)$.

b. At what other point does the normal line in a. intersect the graph of the equation?

318. Find all points on the graph of $y^3 - 27y = x^2 - 90$ at which the tangent line is vertical.

319. For the equation $x^2 + xy + y^2 = 7$,

a. Find the x-intercept(s).

b. Find the slope of the tangent line(s) at the x-intercept(s).

c. What does the value(s) in b. indicate about the tangent line(s)?

320. Find the equation of the tangent line to the graph of the equation $\sin^{-1} x + \sin^{-1} y = \frac{\pi}{6}$ at the point $\left(0, \frac{1}{2}\right)$.

321. Find the equation of the tangent line to the graph of the equation $\tan^{-1}(x + y) = x^2 + \frac{\pi}{4}$ at the point $(0, 1)$.

322. Find y' and y'' for $x^2 + 6xy - 2y^2 = 3$.