3.2b / Practice workbook

Tangent Lines to Implicit Curves

Practice

Problems 1–5 / Show your reasoning

1 Write an equation of the line tangent to the curve $\sqrt{x} + \sqrt{y} = 5$ at the point $(4, 9)$.

2 At which of the following points is the line tangent to the curve $x = y^3 - 3y$ vertical?

A. $(0, 0)$
B. $(0, \sqrt{3})$
C. $(2, -1)$
D. $(-2, -1)$

3.2b / AP-style free response

Problem 3 ➤ */ Show the work and the reasons a grader looks for.*

Consider the curve given by $y^3 - xy = 6$.

(a) Show that $\frac{dy}{dx} = \frac{y}{3y^2 - x}$.

(b) Write an equation of the line tangent to the curve at the point $(-5, 1)$.

(c) Show that the curve has no horizontal tangent line.

3.2b / AP-style free response

Problem 4 ➤ */ Show the work and the reasons a grader looks for.*

Consider the curve given by $x^2 - y^3 + 12y = 20$.

(a) Find $\frac{dy}{dx}$.

(b) Write an equation of the line tangent to the curve at the point $(3, 1)$.

(c) Find all points on the curve at which the line tangent to the curve is vertical.

3.2b / AP-style free response

Problem 5 ➤ */ Show the work and the reasons a grader looks for.*

Consider the curve given by $x^2 - 2xy + 4y^2 = 12$.

(a) Show that $\frac{dy}{dx} = \frac{y - x}{4y - x}$.

(b) Find all points on the curve at which the line tangent to the curve is horizontal.

(c) Write an equation of the line tangent to the curve at the point $(-2, 1)$.

3.2b / Answer key

Tangent Lines to Implicit Curves

1 $y = 9 - \frac{3}{2}(x - 4)$

2 (C)

3 (a) $y/(3 * y * *2 - x)$; (b) $y = 1 + \frac{1}{8}(x + 5)$; (c) a horizontal tangent needs $y = 0$; then the curve gives $0 - 0 = 6$, impossible

4 (a) $\frac{dy}{dx} = \frac{2x}{3y^2 - 12}$; (b) $y = 1 - \frac{2}{3}(x - 3)$; (c) $(2, 2)$, $(-2, 2)$, $(6, -2)$, $(-6, -2)$

5 (a) $(y - x)/(4 * y - x)$; (b) $(2, 2)$ and $(-2, -2)$; (c) $y = 1 + \frac{1}{2}(x + 2)$