

## Implicit Differentiation Released AP Questions

### AP Calculus AB 2004 #4

Consider the curve given by  $x^2 + 4y^2 = 7 + 3xy$ .

- (a) Show that  $\frac{dy}{dx} = \frac{3y - 2x}{8y - 3x}$ .
- (b) Show that there is a point  $P$  with  $x$ -coordinate 3 at which the line tangent to the curve at  $P$  is horizontal. Find the  $y$ -coordinate of  $P$ .
- (c) Find the value of  $\frac{d^2y}{dx^2}$  at the point  $P$  found in part (b). Does the curve have a local maximum, a local minimum, or neither at the point  $P$ ? Justify your answer.

### AP Calculus AB 2008 Form B # 6

Consider the closed curve in the  $xy$ -plane given by

$$x^2 + 2x + y^4 + 4y = 5.$$

- (a) Show that  $\frac{dy}{dx} = \frac{-(x+1)}{2(y^3+1)}$ .
- (b) Write an equation for the line tangent to the curve at the point  $(-2, 1)$ .
- (c) Find the coordinates of the two points on the curve where the line tangent to the curve is vertical.
- (d) Is it possible for this curve to have a horizontal tangent at points where it intersects the  $x$ -axis? Explain your reasoning.

### 2015 #6 No Calculator Permitted

6. Consider the curve given by the equation  $y^3 - xy = 2$ . It can be shown that  $\frac{dy}{dx} = \frac{y}{3y^2 - x}$ .

- (a) Write an equation for the line tangent to the curve at the point  $(-1, 1)$ .
- (b) Find the coordinates of all points on the curve at which the line tangent to the curve at that point is vertical.
- (c) Evaluate  $\frac{d^2y}{dx^2}$  at the point on the curve where  $x = -1$  and  $y = 1$ .