

1.)

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.

2.)

Consider the curve given by $y^2 = 2 + xy$.

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

(b) Find all points (x, y) on the curve where the line tangent to the curve has slope $\frac{1}{2}$.

(c) Show that there are no points (x, y) on the curve where the line tangent to the curve is horizontal.

(d) Let x and y be functions of time t that are related by the equation $y^2 = 2 + xy$. At time $t = 5$, the value of y is 3 and $\frac{dy}{dt} = 6$. Find the value of $\frac{dx}{dt}$ at time $t = 5$.