Name: Richard

QUIZ 13 ♣

MATH 200
February 26, 2026

1. This problem concerns the equation $x^2 + xy + y^2 = 7$

$y = f(x)$

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

$$D_x\left[x^2 + xy + y^2\right] = D_x[7]$$

$$2x + 1y + xy' + 2yy' = 0$$

$$xy' + 2yy' = -2x - y$$

$$y'(x + 2y) = -2x - y$$

$$\boxed{y' = \frac{-2x - y}{x + 2y}}$$

(b) Use your answer from part (a) to find the slope of the tangent to the graph of $x^2 + xy + y^2 = 7$ at the point $(2, -3)$.

$$y'\Big|_{(x,y)=(2,-3)} = \frac{-2(2) - (-3)}{2 + 2(-3)} = \frac{-4 + 3}{2 - 6} = \boxed{\frac{1}{4}}$$

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QUIZ 13 ◊

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1. This problem concerns the equation $xy^3 = xy + 6$

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

$$D_x[xy^3] = D_x[xy + 6]$$

$$= 1 \cdot y^3 + x\,3y^2y' = 1y + xy' + 0$$

$$3xy^2y' - xy' = y - y^3$$

$$y'(3xy^2 - x) = y - y^3$$

$$\boxed{y' = \frac{y - y^3}{3xy^2 - x}}$$

(b) Use your answer from part (a) to find the slope of the tangent to the graph of $xy^3 = xy + 6$ at the point $(1, 2)$.

$$y'\Big|_{(x,y)=(1,2)} = \frac{2 - 2^3}{3 \cdot 1 \cdot 2^2 - 1} = \frac{2 - 8}{12 - 1} = \boxed{-\frac{6}{11}}$$