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① $y-3x-2=0$ — ① $(y=3x+2)$
$3y+x+9=0$ — ② $(y=-\frac{x}{3}-3)$
For the first eqn,
$m_1 = dy/dx = 3$
$m_2 = -1/3$
For perpendicular lines
$m_1 \times m_2 = -1$
$3 \times (-1/3) = -1$
∴ They are perpendicular

② $y = 2/3^x + 7/3$
$y = 2x + 11$
$m_1 = 2/3$
$m_2 = 1$
$(m_1 \times m_2 = -1)$
$2/3 \times 1 = 2/3$
∴ The lines are not perpendicular

3) $x^2+y^2+3xy-11=0 \quad (1,2)$

Using Implicit differentiation,

$2x + 2y\,dy/dx + 3(x\,dy/dx + y) = 0$

$2y\,dy/dx + 3x\,dy/dx = -2x-3y$

$dy/dx(2y+3x) = -2x-3y$

$dy/dx = \frac{-2x-3y}{2y+3x}$

$m = dy/dx\Big|_{x=1,\,y=2}$

$\frac{-2(1)-3(2)}{2(2)+3(1)}$

$m = \frac{-2-6}{4+3}$

$m = -8/7$

$m = +8/7$ or $-1/7$

$y-y_1 = m(x-x_1)$

$y-2 = -8/7(x-1)$

$7y-14 = -8x+8$

$7y = -8x+22$

$y = -8/7x + 22/7$ (eqn of tangent

for normal,

$m_2 = 7/8$

$y-y_1 = m_2(x-x_1)$

$y-2 = 7/8(x-1)$

$8y-16 = 7x-7$

$y = \frac{7x}{8} + \frac{9}{8}$ (eqn of normal)