equation of a line $y = mx + b$

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

$$y - y_1 = \frac{dy}{dx}(x - x_1)$$

$\frac{dy}{dx}$ ↑ derivative of the function

$(x_1, y_1)$ is a point on the curve

Ex) Write the equation of the line tangent to $f(x)=x^3-3x^2-13x+15$ that is parallel to the tangent at $(4,-21)$

$f(x)=x^3-3x^2-13x+15$

$f'(x)=3x^2-6x-13$

$f'(4)=3(4)^2-6(4)-13$

$=3(16)-24-13$

$f'(4)=11$

Set derivative = to 11 (slope) and find the other x

$3x^2-6x-13=11$

solve $\rightarrow$ $3x^2-6x-24=0$

$3x^2-6x-24=0$

$3(x^2-2x-8)=0$

$3(x-4)(x+2)=0$

$x=4 \quad x=-2$

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# 2, 3, 4, 5

This function has a tangent line with slope (gradient) of 11 at $x=4$ and $x=-2$

plug $x=-2$ into $f(x)$ to find $y$ of point

$f(-2)=(-2)^3-3(-2)^2-13(-2)+15$

$=21$ point $(-2,21)$

$\therefore y-21=11(x+2)$