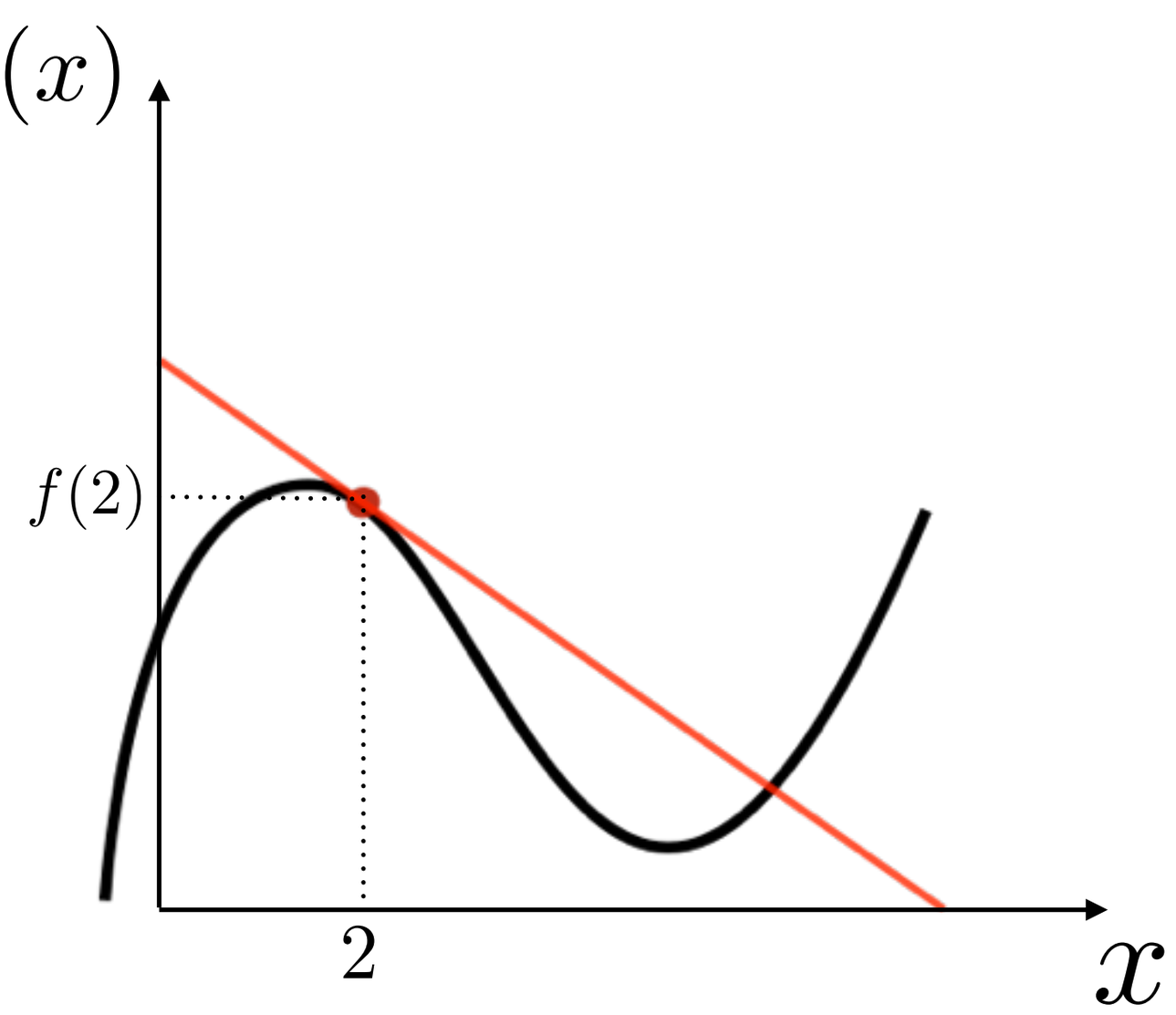
Math reminder

Derivative of a function

$$f'(x) = \frac{d}{dx} f(x)$$



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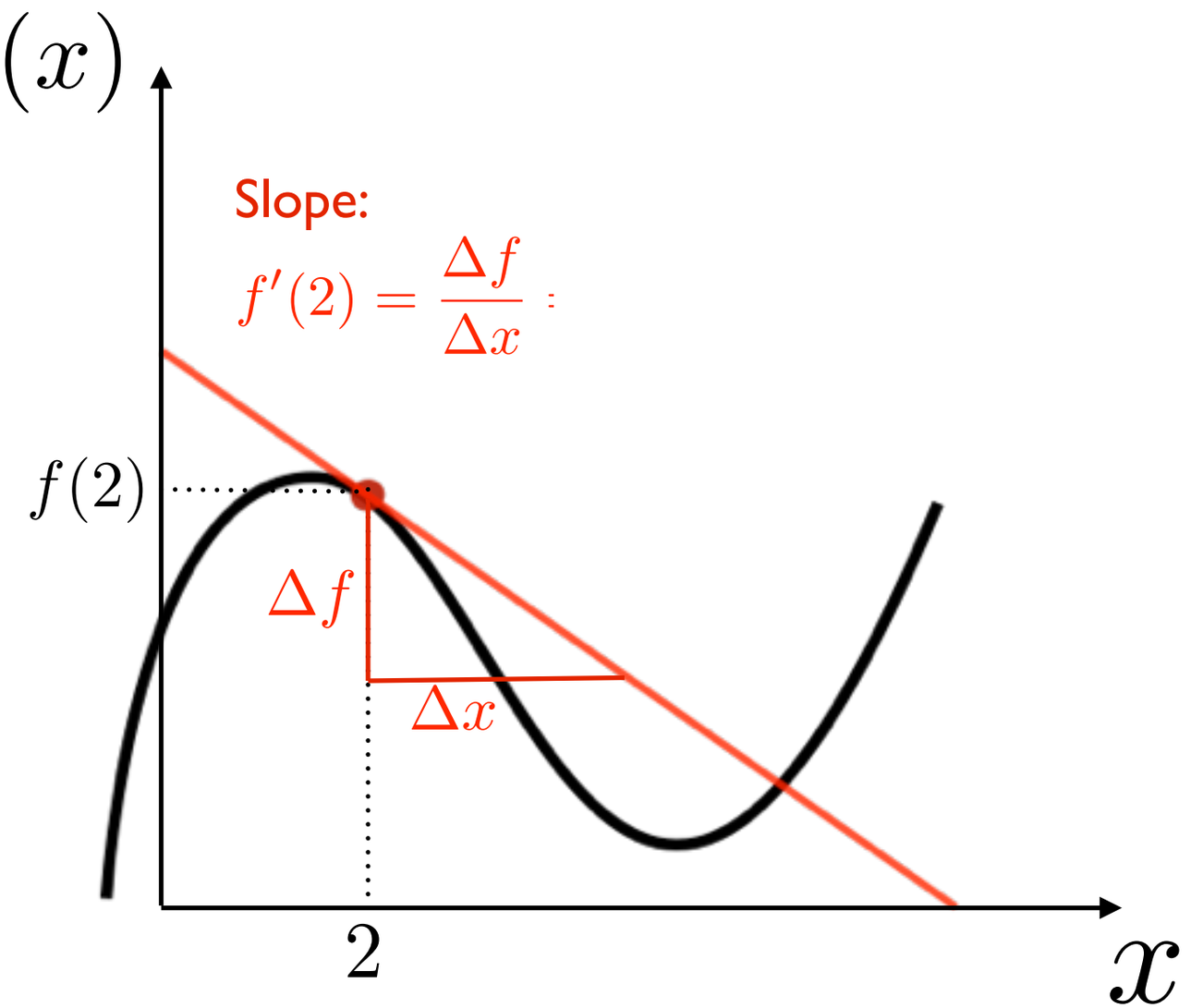

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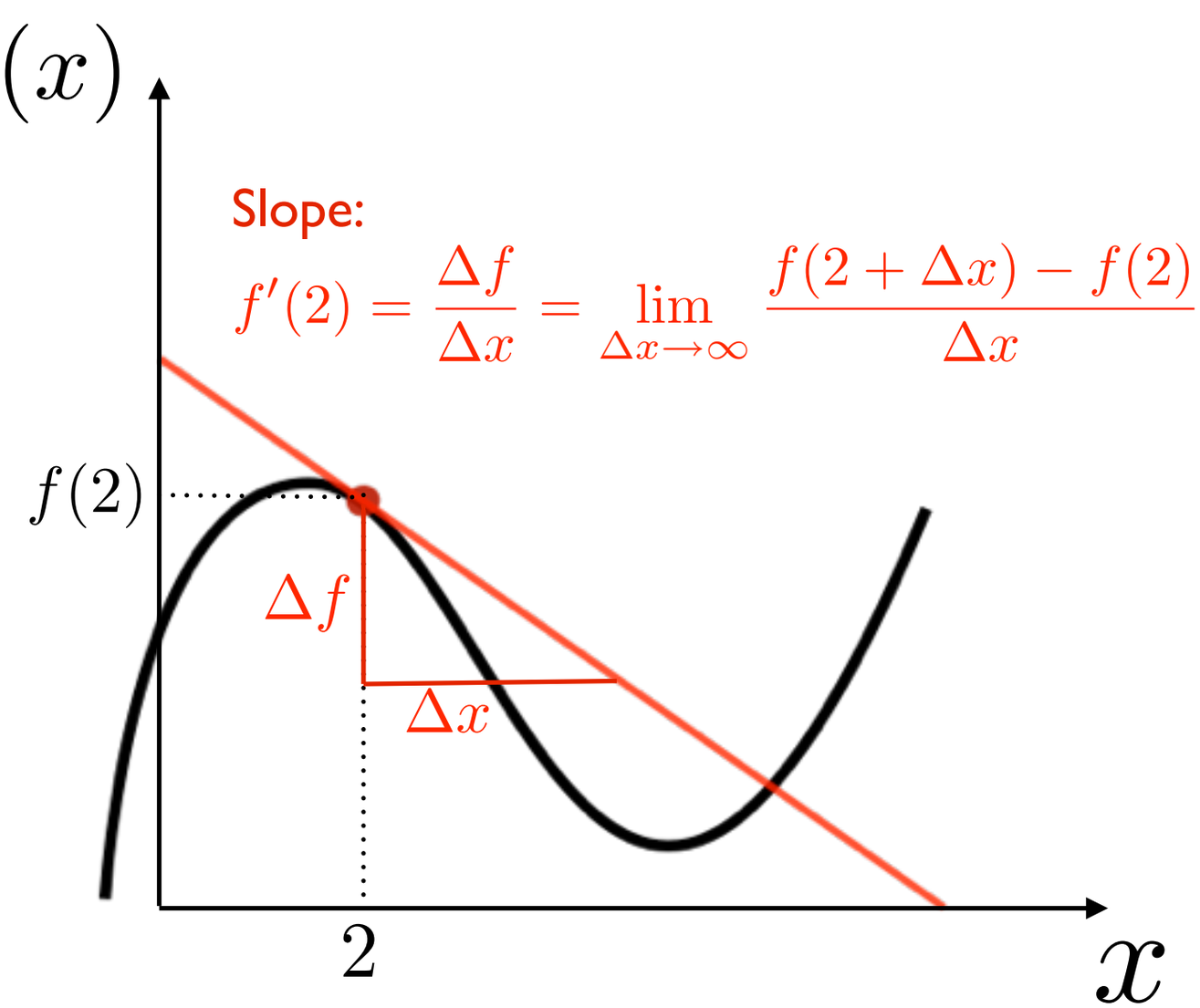

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Derivative of a function

$$f'(x) = \frac{d}{dx} f(x)$$

Product Rule:

$$\frac{d}{dx}\Big(f(x)g(x)\Big) = \left(\frac{d}{dx}f(x)\right)g(x) + f(x)\left(\frac{d}{dx}g(x)\right)$$

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$$\frac{d}{dx}\Big(f(x)g(x)\Big) = \left(\frac{d}{dx}f(x)\right)g(x) + f(x)\left(\frac{d}{dx}g(x)\right)$$

Chain Rule:

$$\frac{d}{dx}f\big(g(x)\big) = \left(\frac{d}{dx}g(x)\right)\left(\frac{d}{dy}f(y)\right)_{y=g(x)}$$

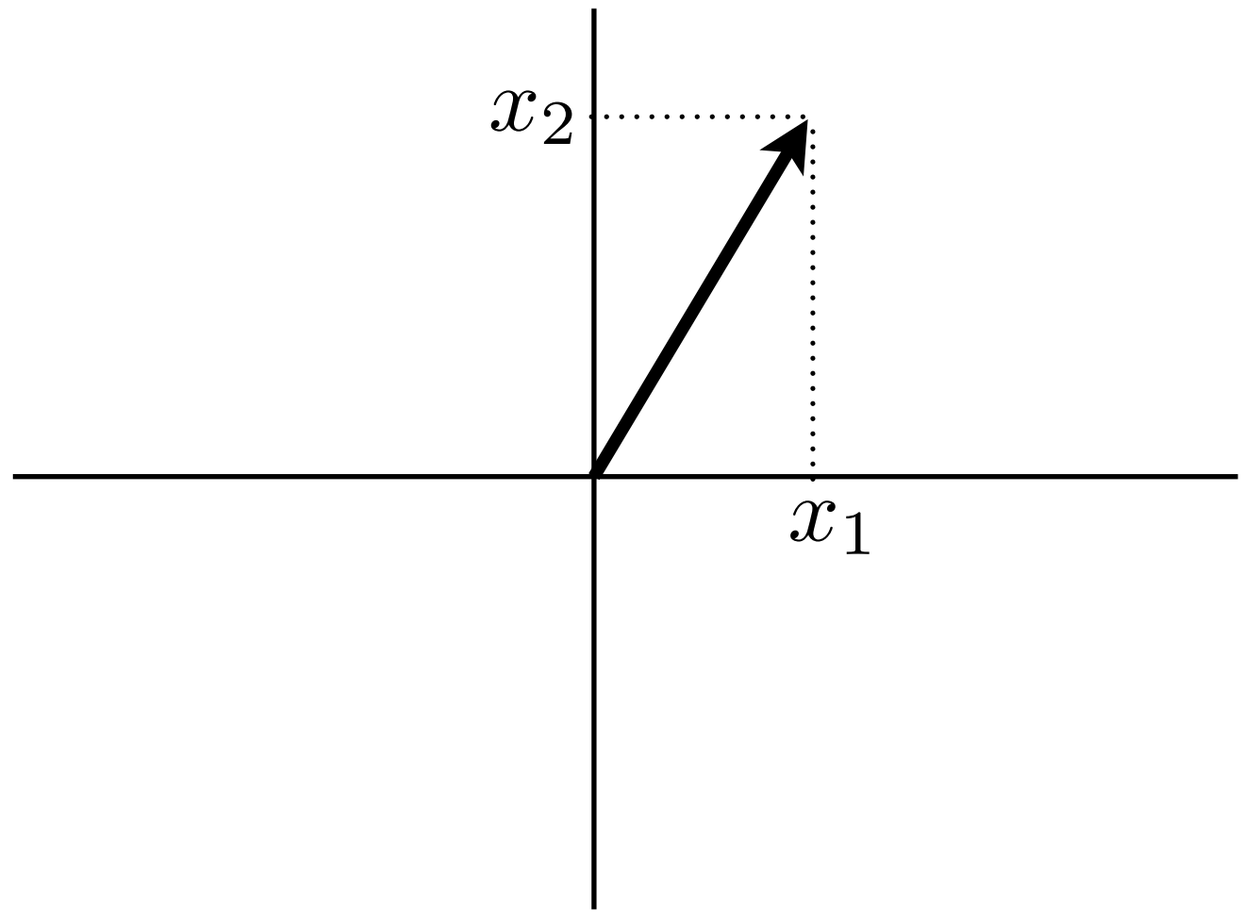
inner derivative

outer derivative

Math reminder

Vector:

$$\mathbf{x} = \begin{pmatrix} x_1 \\ x_2 \end{pmatrix}$$



Math reminder

Vector:

$$\mathbf{x} = \underbrace{\begin{pmatrix} x_1 \\ x_2 \end{pmatrix}}_{\text{column vector}}$$

Transpose:

$$\mathbf{x}^T = \underbrace{\begin{pmatrix} x_1 & x_2 \end{pmatrix}}_{\text{row vector}}$$

Math reminder

Vector:

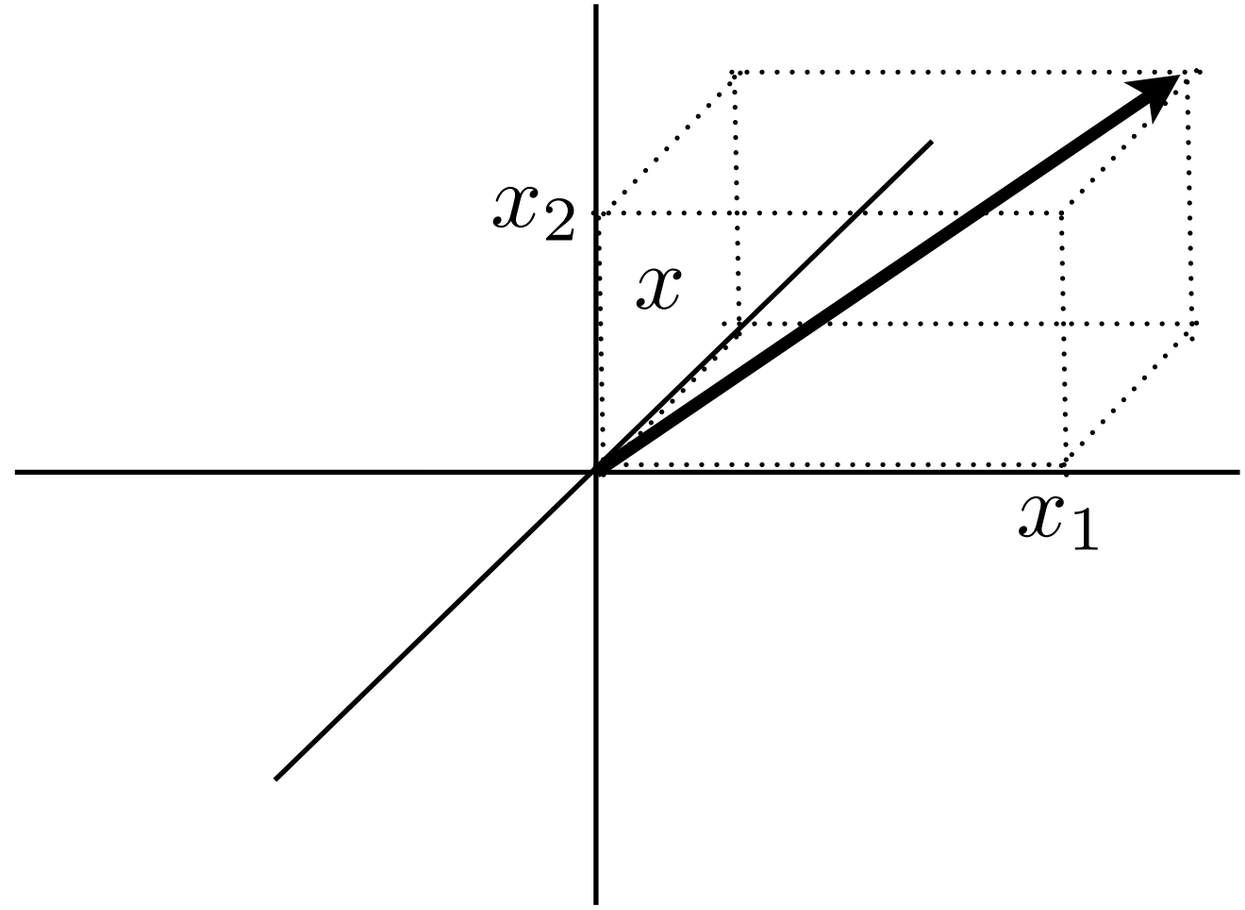
$$\mathbf{x} = \begin{pmatrix} x_1 \\ x_2 \end{pmatrix}$$

Transpose:

$$\mathbf{x}^T = \begin{pmatrix} x_1 & x_2 \end{pmatrix}$$

Vector in 3d:

$$\mathbf{x} = \begin{pmatrix} x_1 \\ x_2 \\ x_3 \end{pmatrix}$$



Math reminder

Vector:

$$\mathbf{x} = \begin{pmatrix} x_1 \\ x_2 \end{pmatrix}$$

Transpose:

$$\mathbf{x}^T = \begin{pmatrix} x_1 & x_2 \end{pmatrix}$$

Vector in 3d:

$$\mathbf{x} = \begin{pmatrix} x_1 \\ x_2 \\ x_3 \end{pmatrix}$$

Transpose:

$$\mathbf{x}^T = \begin{pmatrix} x_1 & x_2 & x_3 \end{pmatrix}$$

Math reminder

Vector:

$$\mathbf{x} = \begin{pmatrix} x_1 \\ x_2 \end{pmatrix}$$

Transpose:

$$\mathbf{x}^T = \begin{pmatrix} x_1 & x_2 \end{pmatrix}$$

Vectors in 3d:

$$\mathbf{x} = \begin{pmatrix} x_1 \\ x_2 \\ x_3 \end{pmatrix} \qquad \mathbf{y} = \begin{pmatrix} y_1 \\ y_2 \\ y_3 \end{pmatrix}$$

Vectors in 4d, 5d, etc.: just add more coefficients

Math reminder

Vector:

$$\mathbf{x} = \begin{pmatrix} x_1 \\ x_2 \end{pmatrix}$$

Transpose:

$$\mathbf{x}^T = \begin{pmatrix} x_1 & x_2 \end{pmatrix}$$

Vectors in 3d:

$$\mathbf{x} = \begin{pmatrix} x_1 \\ x_2 \\ x_3 \end{pmatrix} \qquad \mathbf{y} = \begin{pmatrix} y_1 \\ y_2 \\ y_3 \end{pmatrix}$$

Dot Product:

$$\mathbf{x} \cdot \mathbf{y} = \mathbf{x}^T \mathbf{y} = \begin{pmatrix} x_1 & x_2 & x_3 \end{pmatrix} \begin{pmatrix} y_1 \\ y_2 \\ y_3 \end{pmatrix} = x_1 y_1 + x_2 y_2 + x_3 y_3$$

Math reminder

Vector addition:

$$\mathbf{x} + \mathbf{y} = \begin{pmatrix} x_1 \\ x_2 \end{pmatrix} + \begin{pmatrix} y_1 \\ y_2 \end{pmatrix} = \begin{pmatrix} x_1 + y_1 \\ x_2 + y_2 \end{pmatrix}$$