

① Find the derivative of the function using the definition of derivative

$$F(x) = x^2 + 3x$$

$$F'(x) = \lim_{h \rightarrow 0} \frac{F(x+h) - F(x)}{h} = \lim_{h \rightarrow 0} \frac{(x+h)^2 + 3(x+h) - (x^2 + 3x)}{h} =$$

$$\lim_{h \rightarrow 0} \frac{x^2 + 2hx + h^2 + 3x + 3h - x^2 - 3x}{h} = \lim_{h \rightarrow 0} \frac{2hx + h^2 + 3h}{h} =$$

$$\lim_{h \rightarrow 0} \frac{h(2x+h+3)}{h} = \lim_{h \rightarrow 0} 2x+h+3 = \boxed{2x+3}$$

② Find the equation of the tangent line to the curve at the point (2,7)

$$F(x) = \frac{1}{2}x^2 + x + 3$$

$$F'(x) = \frac{1}{2}(2)x + 1 = x + 1$$

$$F'(2) = 2 + 1 = 3$$

$$y = mx + b$$

$$7 = 3(2) + b$$

$$1 = b$$

$$\boxed{\text{So } y = 3x + 1}$$