IBDP Mathematics
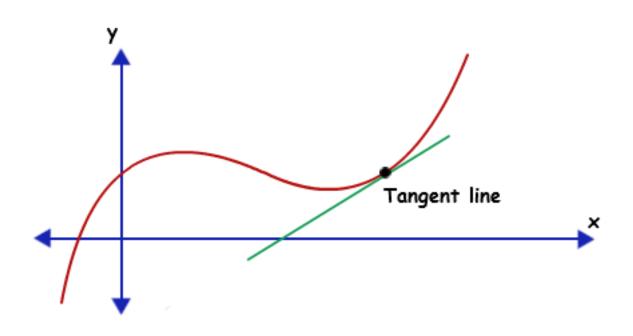Analysis and approaches (SL)
Tangent and normal line

Equation of tangent and normal

Meaning of derivative $y', \dfrac{dy}{dx}, f'(x)$

Slope of the curve
Slope of the tangent line

Two steps to find the equation of straight line

$$y = mx + c$$

1. Slope (m)
2. point (x, y)

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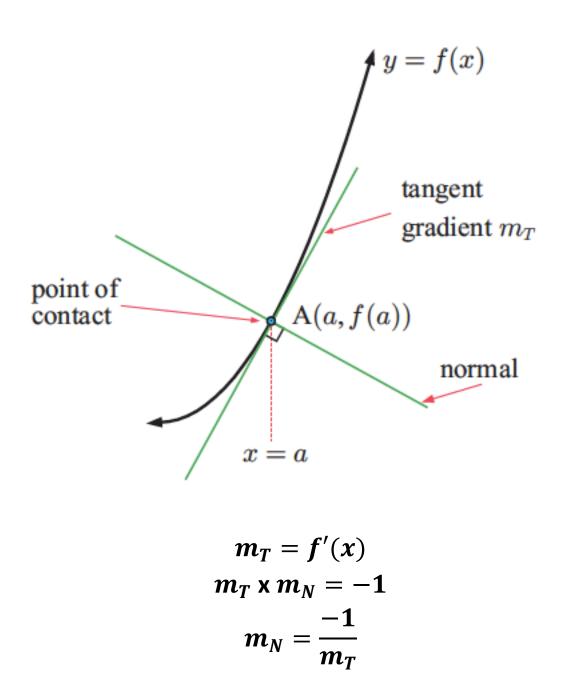Analysis and approaches (SL)
Tangent and normal line

1. Find the equation of the tangent to $f(x) = 2x^2 + 5$ at the point where $x = 2$.

2. Find the equation of the tangent to $f(x) = x^3 - 4x$ at $(1, -3)$.

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Equation of normal

$$m_T = f'(x)$$
$$m_T \times m_N = -1$$
$$m_N = \frac{-1}{m_T}$$

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1. Find the equation of the normal to $f(x) = 2x^2 - 10$ at the point where $x = -1$.
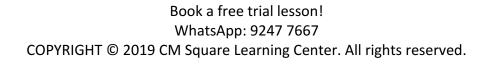
2. Find the equation of the normal to $f(x) = \ln \sqrt{x} + 5$ at the point where $x = 2$.

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Paper 1

1. Let $f(x) = e^{2x}$. The line L is the tangent to the curve of f at $(1, e^2)$.

Find the equation of L in the form $y = ax + b$.

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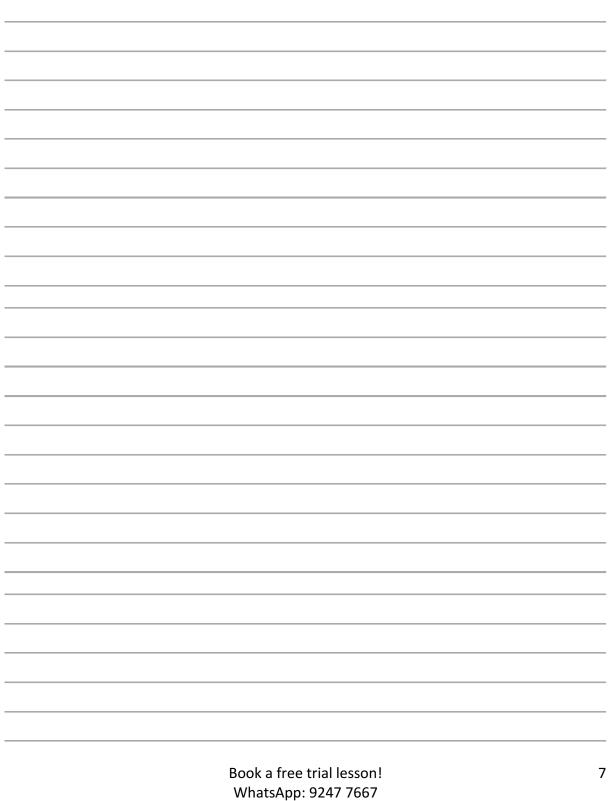Analysis and approaches (SL)
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2. Let $f(x) = kx^4$. The point P(1, k) lies on the curve of f. At P, the normal to the curve is parallel to $y = -\frac{1}{8}x$. Find the value of k.

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3. Let $f(x) = \dfrac{g(x)}{h(x)}$, where

$g(2) = 18, h(2) = 6, g'(2) = 5, and\ h'(2) = 2.$

Find the equation of the normal to the graph of f at $x = 2$.

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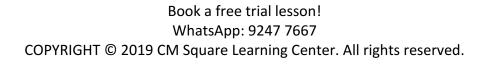Analysis and approaches (SL)
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4. 🔲 Consider the function $f(x) = k \sin x + 3x$, where k is a constant.

(a) Find $f'(x)$

(b) When $x = \frac{\pi}{3}$, the gradient of the curve of $f(x)$ is 8. Find the value of k.

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Paper 2

1. 🖩 $f(x) = \dfrac{\ln(4x)}{x}$, for $0 \le x \le 5$.

Point P(0.25, 0) and Q are on the curve of f. The tangent to the curve of f at P is perpendicular to the tangent at Q. Find the coordinates of Q.

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2. ⊞ Let $f(x) = \frac{g(x)}{h(x)}$, where $g(2) = 18$, $h(2) = 6$, $g'(2) = 5$ and $h'(2) = 2$. Find the equation of the normal to the graph of f at $x = 2$.