

9 Functions f and g are defined by

$$f(x) = 2x^2 + 8x + 1 \quad \text{for } x \in \mathbb{R},$$

$$g(x) = 2x - k \quad \text{for } x \in \mathbb{R},$$

where k is a constant.

- (i)** Find the value of k for which the line $y = g(x)$ is a tangent to the curve $y = f(x)$. [3]

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- (ii)** In the case where $k = -9$, find the set of values of x for which $f(x) < g(x)$. [3]

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(iii) In the case where $k = -1$, find $g^{-1}f(x)$ and solve the equation $g^{-1}f(x) = 0$.

[3]

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(iv) Express $f(x)$ in the form $2(x + a)^2 + b$, where a and b are constants, and hence state the least value of $f(x)$. [3]

[3]

[illegible]