① $y = 2x^2 - 7x + 6$

when $x = 4$, $y = 2 \times 4^2 - 7 \times 4 + 6 = 10$

The point is at $(4, 10)$

$y' = 4x - 7$

Gradient of tangent $= y' = 4 \times 4 - 7$

$= 9$

Equation of tangent $\quad y = mx + c$

Sub in $x = 4$, $y = 10$ and $m = 9$

$10 = 9 \times 4 + c$

$10 - 36 = c$

$-26 = c$ $\qquad y = 9x - 26$

Gradient of normal $= \dfrac{-1}{\text{gradient of tangent}}$

$= \dfrac{-1}{9}$

Equation of normal $= \quad y = mx + c$

$m = \dfrac{-1}{9}$, $x = 4$, $y = 10$

$10 = \dfrac{-1}{9} \times 4 + c$

$10 + \dfrac{4}{9} = c$

$10\dfrac{4}{9} = c$

$y = -\dfrac{1}{9}x + 10\dfrac{4}{9}$

(2) $\quad y = x^2 + 4x - 1$

$\quad\quad y' = 2x + 4$

gradient parallel to the line $y = 30x$

$$y' = \text{gradient} = 30$$

$$30 = 2x + 4$$

$$26 = 2x$$

$$13 = x \quad\quad y = 13^2 + 4 \times 13 - 1$$

$$= 220$$

Answer: When $x = 13$, $y = 200$,
the tangent line will be
parallel to $y = 30x$