1.) $y = 2x^2$ at (1,2)

i) Equation of a tangent

$dy/dx(y) = 4x$ at $x = 1 = 4$

$\therefore m = 4$

$y = mx + B$ at (1,2)

$2 = 4 + B$

$\Rightarrow B = -2$

substituting for B,

$y = 4x - 2$ => equation of tangent // line

ii) Equation of the normal

negative reciprocal of m

$\therefore m = -1/4$

subst in $y = mx + B$ at (1,2)

$y = -x/4 + B$

$\Rightarrow 2 = -1/4 + B$

$\Rightarrow B = 9/4$

Eqn => $y = -x/4 + 9/4$ //

2.) $y = 3x^2 - 2x$ at (2,8)

i) Equation of a tangent

$dy/dx(y) = 6x - 2$ at (2)

$\Rightarrow 6(2) - 2 = m = 10$

$y = mx + B$ at (2,8)

$8 = (10 \times 2) + B$

$\Rightarrow B = -12$

subst for B

$y = 10x - 12$ //

ii) Equation of the normal

negative reciprocal for m

$m = -1/10$

subst in $y = mx + B$ at (2,8)

$8 = -2/10 + B$

$\Rightarrow B = +1/5$

Eqn => $y = -x/5 + 4\,1/5$ //

3) $y = x^3/2$ at $(-1, -1/2)$

i) Equation of a tangent

$y = x^3 \times 1/2$

$dy/dx\,(y) = 3/2(x^2)$ at $x = -1$

$m = 3/2\,(-1)^2 = 3/2$

$y = mx + b$ at $(-1, -1/2)$

$-1/2 = -3/2 + b$

$b = 1$

substitute b in $y = mx + b$

$y = 3x/2 + 1$ //

ii) Equation of the normal

negative reciprocal of m

$\Rightarrow m = -2/3$

subst m in $y = mx + b$

$-1/2 = 2/3 + b$

$\therefore b = 7/6$

subst b in $y = mx + b$

$y = -2/3x + 7/6$ //

4) $y = 1 + x - x^2$ at $(-2, 5)$

i) Equation of a tangent

$dy/dx\,(y) = 1 - 2x$ at $x = -2$

$\therefore m = 1 + 4 = 5$

$y = mx + b$ at $(-2, 5)$

$5 = (5 \times -2) + b$

$\therefore b = 15$

subst b in $y = mx + b$

$y = 5x + 15$ //

ii) Equation of the normal

negative reciprocal of m

$\Rightarrow m = -1/5$

subst m in $y = mx + b$

$5 = 2/5 + b$

$\therefore b = 23/5$

Subst b in $y = mx + b$

$y = -x/5 + 23/5$ //

5.) $y = 1/x$ at $(3, 1/3)$

i) Equation of the tangent

$y = x^{-1}$

$dy/dx(y) = -1/x^2$ at $x = 3$

$\therefore m = -1/3^2 = -1/9$

$y = mx + B$ at $(3, 1/3)$

$1/3 = -3/9 + b$

$\Rightarrow \therefore b = 2/3$

substituting for b

$y = -x/9 + 2/3$ //

ii) Equation of the normal

negative reciprocal of m

$\Rightarrow m = 9$

subst m in $y = mx + b$

$1/3 = 27 + b$

$\Rightarrow \therefore b = -80/3$

Subst. b in $y = mx + b$

$y = 9x - 80/3$ //