Q1 (ii) $f(x) = 3x - 4$

$f(x+h) = 3(x+h) - 4$

$f(x+h) - f(x) = 3x + 3h - 4 - 3x + 4$

$= 3h$

$\frac{f(x+h) - f(x)}{h} = \frac{3h}{h} = 3.$

$\lim_{h \to 0} \frac{f(x+h) - f(x)}{h} = \lim_{h \to 0} 3 = 3$

Q2 (ii) $f(x) = 2x^2 + 9x$

$f(x+h) = 2(x+h)^2 + 9(x+h)$

$= 2x^2 + 4hx + 2h^2 + 9x + 9h$

$f(x+h) - f(x) = 4hx + 2h^2 + 9h$

$\frac{f(x+h) - f(x)}{h} = \frac{4hx + 2h^2 + 9h}{h} = 4x + 2h + 9.$

$\lim_{h \to 0} \frac{f(x+h) - f(x)}{h} = \lim_{h \to 0} 4x + 2h + 9 = 4x + 9.$

Q3 (i) $f(x) = x^2 - 2x + 5$

$f(x+h) = (x+h)^2 - 2(x+h) + 5$

$= x^2 + 2hx + h^2 - 2x - 2h + 5$

$f(x+h) - f(x) = 2hx + h^2 - 2h$

$\frac{f(x+h)-f(x)}{h} = \frac{2hx + h^2 - 2h}{h} = 2x + h - 2.$

$\lim_{h \to 0} \frac{f(x+h) - f(x)}{h} = \lim_{h \to 0} 2x + h - 2 = 2x - 2.$

(ii) Slope at $(2, 5)$ $\Rightarrow f'(x)$ at $x = 2$.

$2(2) - 2 = 2.$

(iii) eqn of Tangent $y - y_1 = m(x - x_1)$ pt $(2, 5)$, $m = 2$.

$y - 5 = 2(x - 2)$

$y - 5 = 2x - 4$

$y = 2x + 1.$

Q5 (iii) $f(x) = 2 - x - 3x^2$

$f(x+h) = 2 - (x+h) - 3(x+h)^2$

$= 2 - x - h - 3x^2 - 6hx - 3h^2$

$f(x+h) - f(x) = -h - 6hx - 3h^2$

$\frac{f(x+h)-f(x)}{h} = \frac{-h - 6hx - 3h^2}{h} = -1 - 6x - 3h.$

$\lim_{h \to 0} \frac{f(x+h)-f(x)}{h} = \lim_{h \to 0} -1 - 6x - 3h = -1 - 6x.$

@6

(i) $f(x) = 2x^2 - 3x - 2$

$f(x+h) = 2(x+h)^2 - 3(x+h) - 2$

$= 2x^2 + 4hx + 2h^2 - 3x - 3h - 2.$

$f(x+h) - f(x) = 4hx + 2h^2 - 3h$

$\frac{f(x+h) - f(x)}{h} = \frac{4hx + 2h^2 - 3h}{h} = 4x + 2h - 3.$

$\lim_{h \to 0} \frac{f(x+h) - f(x)}{h} = \lim_{h \to 0} 4x + 2h - 3 = 4x - 3$

at $x = 3$: $12 - 3 = 9$

(ii) Eqn of Tangent $y - y_1 = m(x - x_1)$ pt $(3, 7)$ $m = 9$

$y - 7 = 9(x - 3)$

$y - 7 = 9x - 27$

$y = 9x - 20.$