③ c) $y = x + \frac{6}{x}$, $(\overset{x_1}{2}, \overset{y_1}{5})$ $m = \frac{-1}{2}$

① Find Derivative

$y = x + 6x^{-1}$

$y' = 1 - 6x^{-2}$

$y' = 1 - \frac{6}{x^2}$

② Sub in x-value $(x = 2)$

$y' = 1 - \frac{6}{(2)^2}$

$y' = \frac{4}{4} - \frac{6}{4}$

$y' = \frac{-2}{4} = \boxed{\frac{-1}{2}}$

Slope of the tangent "m"

③ Find the equation:

$y - y_1 = m(x - x_1)$

$2 \cdot y - 5 = \frac{-1}{2}(x - 2)$

$2y - 10 = -1(x - 2)$

$2y - 10 = -x + 2$

$\boxed{x + 2y - 12 = 0}$

④ a) $y = x^5$ $\quad x = 2$ $\quad$ Point $(2, 32)$

$y = (2)^5$ $\quad m = 80$

$y = 32$

① Find Derivative

$y' = 5x^4$

② Sub in x-value $(x=2)$

$y' = 5(2)^4$

$y' = 5(16)$

$y' = \boxed{80}$

Slope

③ Find the equation:

$y - y_1 = m(x - x_1)$

$y - 32 = 80(x - 2)$

$y - 32 = 80x - 160$

$-80x + y + 128 = 0$

$\boxed{80x - y - 128 = 0}$

⑧ $y = x\sqrt{x}$

parallel to: $6x - y = 4$

$-y = -6x + 4$

$y = 6x - 4$

$m = 6$

$y = (x)(x^{1/2})$

$y = x^{3/2}$

$y' = \frac{3}{2}x^{1/2}$

$y' = \boxed{\frac{3\sqrt{x}}{2}}$

$6 = \frac{3\sqrt{x}}{2}$

$\frac{12}{3} = \frac{3\sqrt{x}}{3}$

$(4)^2 = (\sqrt{x})^2$

$\boxed{16 = x}$

$\therefore$ The point is $(16, 64)$

$y = x\sqrt{x}$

$y = (16)\sqrt{16}$

$y = 16(4)$

$\boxed{y = 64}$

1 g) $y = \dfrac{x+1}{\sqrt{x}} = \dfrac{x+1}{x^{1/2}} = x^{-1/2}(x+1)$

$= x^{1/2} + x^{-1/2}$

$$\boxed{y' = \frac{1}{2}x^{-1/2} - \frac{1}{2}x^{-3/2}}$$

$$y' = \frac{1}{2x^{1/2}} - \frac{1}{2x^{3/2}}$$

① a) $f(x) = x^2 + 4x$

$F'(x) = 2x + 4$

d) $g(x) = x^2 - \frac{2}{x^2} = x^2 - 2x^{-2}$

$g'(x) = 2x + 4x^{-3}$

$g'(x) = 2x + \frac{4}{x^3}$

g) $y = \frac{x+1}{\sqrt{x}} = \frac{x+1}{x^{1/2}} = x^{-1/2}(x+1)$

$= x^{1/2} + x^{-1/2}$

$$\boxed{y' = \frac{1}{2}x^{-1/2} - \frac{1}{2}x^{-3/2}}$$

or $y' = \frac{1}{2x^{1/2}} - \frac{1}{2x^{3/2}}$

or $y' = \frac{1}{2\sqrt{x}} - \frac{1}{2\sqrt{x^3}}$

e) $h(x) = \sqrt{x} - 5x^4$

$= x^{1/2} - 5x^4$

$h'(x) = \frac{1}{2}x^{-1/2} - 20x^3$

$= \frac{1}{2x^{1/2}} - 20x^3$

④ b) $y = 2\sqrt{x}$; $\overset{x_1,\,y_1}{(9, 6)}$; $m = \frac{1}{3}$

① Find Derivative

$$y = 2x^{1/2}$$

$$y' = 1x^{-1/2}$$

$$y' = \frac{1}{x^{1/2}} = \frac{1}{\sqrt{x}}$$

② Sub in x-value (x=9)

$$y' = \frac{1}{\sqrt{9}} = \boxed{\frac{1}{3}}$$

Slope of the tangent "m"

③ Find the Equation

$$y - y_1 = m(x - x_1)$$

$$3 \cdot\ y \overset{3\cdot}{-} 6 = \overset{3\cdot}{\frac{1}{3}}(x - 9)$$

$$3y - 18 = 1(x - 9)$$

$$3y - 18 = x - 9$$

$$-x + 3y - 9 = 0$$

$$\boxed{x - 3y + 9 = 0}$$

7

$y = 3x^2$

$y' = 6x$

$24 = 6x$

$\boxed{4 = x}$

$y = 3(4)^2$

$y = 3(16)$

$\boxed{y = 48}$

$\therefore$ The point is $(4, 48)$

From Review

7 c) $g(x) = 4x^3 - \frac{6}{x^2} + 14x$

$g(x) = 4x^3 - 6x^{-2} + 14x$

$g'(x) = 12x^2 + 12x^{-3} + 14x^0$

$\boxed{g'(x) = 12x^2 + \frac{12}{x^3} + 14}$

9 a) $f(x) = 3x^5 + \sqrt[3]{x}$

$f(x) = 3x^5 + x^{1/3}$

$f'(x) = 15x^4 + \frac{1}{3}x^{-2/3}$

$\boxed{f'(x) = 15x^4 + \frac{1}{3x^{2/3}}}$

or $f'(x) = 15x^4 + \frac{1}{3\sqrt[3]{x^2}}$

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

b) $f(x) = \boxed{\dfrac{2x-1}{4x}}$

$$f(x+h) = \frac{2(x+h)-1}{4(x+h)}$$

$$= \boxed{\frac{2x+2h-1}{4x+4h}}$$

$$f'(x) = \lim_{h \to 0} \frac{\dfrac{2x+2h-1}{(4x+4h)} - \dfrac{(2x-1)}{(4x)}}{h}$$

$$= \lim_{h \to 0} \frac{4x(2x+2h-1) - (2x-1)(4x+4h)}{h(4x)(4x+4h)}$$

$$= \lim_{h \to 0} \frac{8x^2+8xh-4x-(8x^2+8xh-4x-4h)}{h(4x)(4x+4h)}$$

$$= \lim_{h \to 0} \frac{\cancel{8x^2}+\cancel{8xh}-\cancel{4x}-\cancel{8x^2}-\cancel{8xh}+\cancel{4x}+4h}{h(4x)(4x+4h)}$$

$$= \lim_{h \to 0} \frac{4\cancel{h}}{\cancel{h}(4x)(4x+4h)} = \frac{4}{(4x)^2} = \frac{4}{16x^2} = \boxed{\frac{1}{4x^2}}$$