Sec 2.6 page 142 (1, 3, 5, 6, 8, 9, 11, 12, 23, 24, 26)

1) a) $m = \dfrac{f(x) - f(3)}{x - 3}$

b) $\lim\limits_{x \to 3} \dfrac{f(x) - f(3)}{x - 3}$

3) i) $m = \lim\limits_{x \to 1} \dfrac{4x - x^2 - 3}{x - 1} = \dfrac{(-x+3)\cancel{(x-1)}}{\cancel{(x-1)}} = 2$

b) $y - 3 = 2(x-1) \Leftrightarrow y = 2x - 1$

ii) $m = \lim\limits_{h \to 0} \dfrac{4(x+h) - (x+h)^2 - 3 - 4x + x^2 + 3}{h} = 2$

b) $y - 3 = 2(x-1) \Leftrightarrow y = 2x - 1$

5) $m = \lim\limits_{x \to 2} \dfrac{4x - 3x^2 + 4}{x - 2} = \dfrac{(-3x-2)(x-2)}{x-2} = -8$

$\boxed{y + 4 = -8(x-2) \Leftrightarrow y = -8x + 12}$

6) $m = \lim\limits_{x \to 2} \dfrac{x^3 - 3x + 1 - 3}{x - 2} = \lim\limits_{x \to 2} \dfrac{x^3 - 3x - 2}{x - 2}$

$= \lim\limits_{x \to 2} \dfrac{\cancel{(x-2)}(x^2 + 2x + 1)}{\cancel{x-2}} = 4 + 4 + 1 = 9$

$x^2 + 2x + 1$
$x - 2 \,\overline{)\, x^3 + 0x^2 - 3x - 2}$
$-x^3 + 2x^2$
$2x^2 - 3x$
$-2x^2 + 4x$
$x - 2$

$\boxed{y - 3 = 9(x-2) \Leftrightarrow y = 9x - 15}$

(8) $m = \lim\limits_{x\to 1} \dfrac{\frac{2x+1}{x+2} - 1}{x-1} = \lim\limits_{x\to 1} \dfrac{2x+1-x-2}{(x-1)(x+2)}$

$= \lim\limits_{x\to 1} \dfrac{\cancel{x-1}}{\cancel{(x-1)}(x+2)} = \dfrac{1}{3}$

$\boxed{y - 1 = \frac{1}{3}(x-1) \Leftrightarrow y = \frac{1}{3}x + \frac{2}{3}}$

(9) $\lim\limits_{h\to 0} \dfrac{\cancel{8} + 4(x+h)^2 - 2(x+h)^3 - \cancel{8} - 4x^2 + 2x^3}{h}$

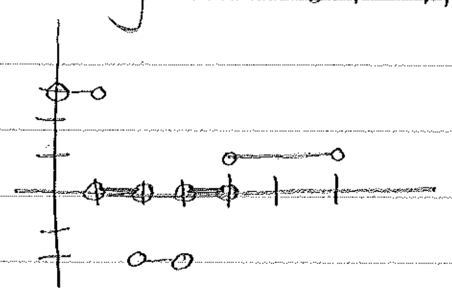
$\lim\limits_{h\to 0} \dfrac{8xh + 4h^2 - 2(x^3 + 3x^2h + 3xh^2 + h^3) + 2x^3}{h}$

$\lim\limits_{h\to 0} \dfrac{8xh + 4h^2 - 6x^2h - 6xh^2 - 2h^3}{h}$

$8x - 6x^2$ or $\boxed{f'(a) = 8a - 6a^2}$

(11) a) moving right on $(0,1)$ and $(4,6)$
moving left on $(2,3)$
standing still on $(1,2)$ and $(3,4)$

b)



(12) a) Runner A : constant velocity
Runner B : slower at first - speeds up halfway through

b) between 9 and 10 sec

c) ≈ 9.5 sec

23) $f'(1) = \lim_{h \to 0} \frac{f(1+h) - f(1)}{h} = \lim_{h \to 0} \frac{3(1+h)^2 - (1+h)^3 - 2}{h}$

$= \lim_{h \to 0} \frac{3(1+2h+h^2) - (1+3h+3h^2+h^3) - 2}{h}$

$= \lim_{h \to 0} \frac{\cancel{3} + 6h + 3h^2 - \cancel{1} - 3h - 3h^2 - h^3 - \cancel{2}}{h}$

$= 6 - 3 + 3h - 3h - h^2 = 3$

$\boxed{y - 2 = 3(x-1) \Leftrightarrow y = 3x - 1}$

24) $g'(1) = \lim_{x \to 1} \frac{x^4 - 2 - (-1)}{x - 1} = \lim_{x \to 1} \frac{x^4 - 1}{x - 1}$

$= \lim_{x \to 1} \frac{(x^2-1)(x^2+1)}{x-1} = \lim_{x \to 1} \frac{\cancel{(x-1)}(x+1)(x^2+1)}{\cancel{x-1}}$

$= 4$

$\boxed{y + 1 = 4(x-1) \Leftrightarrow y = 4x - 5}$

26) $G'(a) = 8a - 3a^2$

point $(2, 8)$

$m = 8(2) - 3(2)^2 = 4$

$y - 8 = 4(x - 2)$

$\boxed{y = 4x}$

point $(3, 9)$

$m = 8(3) - 3(3)^2 = -3$

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

$\boxed{y = -3x + 18}$

b) graph $[-2, 7] \times [-2, 12]$